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APRIL
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NO. 4

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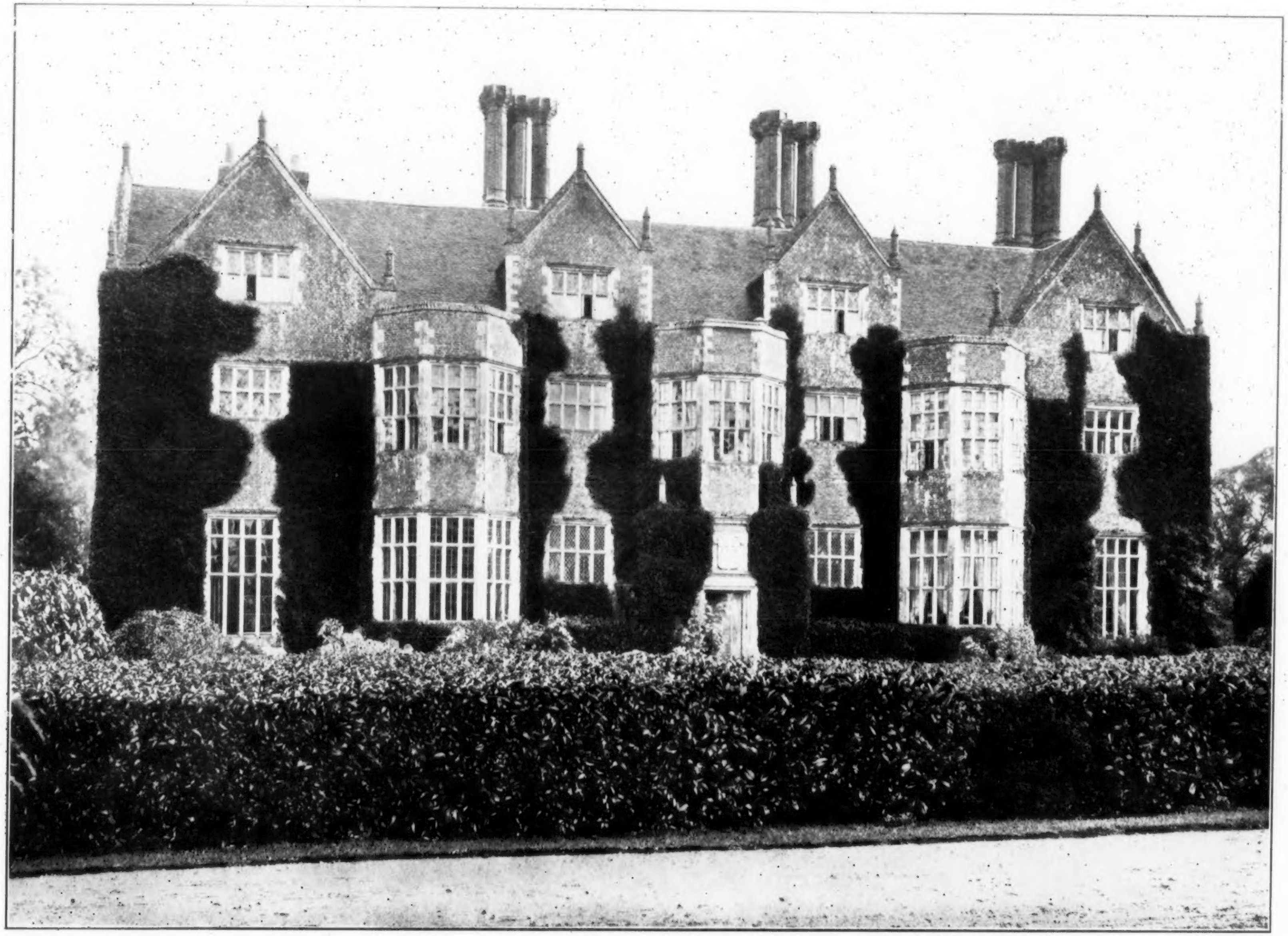


MOYNS PARK, THE FRONT, ESSEX, ENGLAND.

THE BRICKBVILDER

VOL. 16 NO. 4 DEVOTED·TO·THE·INTERESTS·OF·ARCHITECTVRE·IN MATERIALS·OF·CLAY· APRIL 1907

# The Final Report on the San Francisco Fire.

THE disaster at San Francisco of a year ago has been exploited so exhaustively in the technical journals that it seems hardly worth while to take up space with new statements regarding the fire, earthquake, or the results of either or both combined, but the final report published in the proceedings of the American Society of Civil Engineers is in some respects of so extraordinary a nature that we can not refrain from certain comments thereon. The statement is made that all the evidence from the recent shock favors reinforced concrete; but this is directly offset by the added statement that "the steel frame offers the best solution of the problem." If a steel frame is better than one of reinforced concrete for the building as a whole, the question of floor construction resolves itself simply into a matter of fireproofing, and later on the emphatic statement is made that "concrete floors generally had hung ceilings and *where* thus protected were uninjured. Where exposed, the concrete was in most cases destroyed, as in the Sloan, Rialto and Aronson buildings and the Crocker warehouse. The concrete in these cases was dry and while in many cases hard, it was virtually destroyed." We fail to see why, under such circumstances, the report is not virtually a condemnation of concrete as a fireproof material, after a general condemnation of it for reinforced work; and though the report cites instances where the terra cotta failed to maintain itself intact, the explanation always follows that it was of a hard, dense type, quite brittle when exposed to heat, but that even then the terra cotta answered its purpose as "the steel frames were the least injured of any part of the various structures."

With one part of the report we are thoroughly in accord. "A logical deduction from the statement that all materials were destroyed is the conclusion that all structural parts of a building, of whatever material constructed, must be protected by another material which will be a more or less complete loss in a fire. This applies to a steel frame, to floors of any type and to roofs. It is impossible to protect some parts such as fronts, partitions aud other parts directly exposed. The floors and frame constitute the structural parts, failure of which means destruction of the building. All such should be fireproofed. This remark applies with equal force to buildings with reinforced-concrete columns, girders, beams and floors. As integral structural parts they should be fireproofed as well as similar members of a steel-frame structure, *for concrete is destroyed by fire nearly as quickly as steel*."

Accepting this statement, we can hardly agree with the deduction made by the Society that terra cotta is the least valuable of all the materials that are used for fireproofing. In a conflagration where everything goes to pieces, even when built with care, which was certainly not always the case in San Francisco, where the terra cotta used was not of the grade which is considered the best for fire protection, and where every form of column and beam protection is first rudely shattered by earthquake shocks, and then in its loosened condition exposed to the most destructive influence of a conflagration, the wonder is not that concrete and terra cotta both suffered, but that anything was left to tell the tale.

We cannot read a description of the results of the fire, even as presented by this report of the Society of Civil Engineers, without a conviction which seems to be supported by the fact that concrete in most cases was shattered beyond repair and almost totally destroyed by fire, leaving, in many cases, the columns entirely bare; while terra cotta, because of its very elasticity, suffered less initial damage and was finally able to resist the fire more completely. It would be manifestly abortive to establish any comparison between the poorest terra cotta and the best concrete, and yet that seems to be the attitude which is taken by many of the investigators who have studied San Francisco. In no other one city has concrete been used so extensively and with so free a hand, and in the light of Mr. Stewart's figures, which we print elsewhere, we can feel drawn to only one conclusion: any material would be wrecked by combined earthquake and fire; and, when dependence is placed entirely upon an unprotected constructive material, the building is sure to fail throughout, so that the proper construction would seem to be a well designed and thoroughly braced steel frame protected by and filled in between with the material which suffers least by the direct action of fire, and that material is unquestionably burnt clay in some of its various forms. The report emphasizes this when it states further that "for columns, the fireproofing that will stand up best is red brick set in Portland cement mortar." *Terra cotta, when properly constructed and applied, will resist more heat than red brick.*

# Sanatoria for Consumptives.

AT a meeting of The Architectural Association, held recently in London, Mr. Edwin T. Hall, a member, who had made a very thorough study of sanatoria for comsumptives in England and on the Continent, submitted a paper upon that subject which was illustrated by a large number of plans, of which those given in this issue are a representative selection.

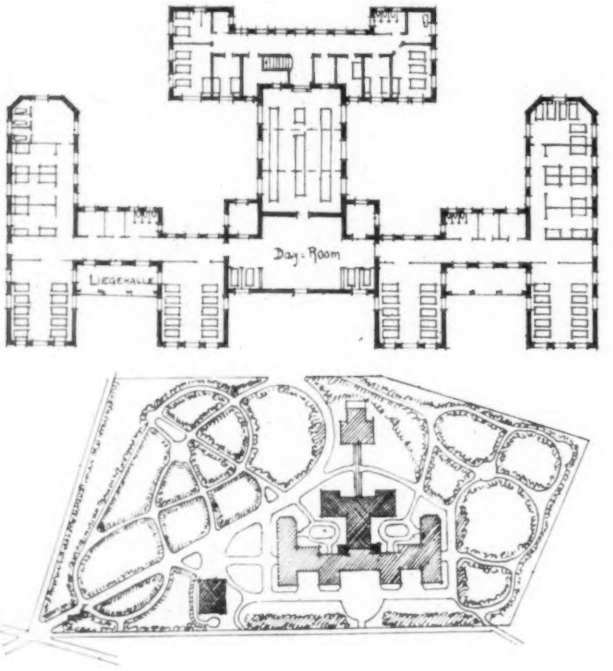


FIG. 1. SANATORIUM, ALBERTSBERG, GERMANY.

It was pointed out that Germany had given first attention to the provision of such buildings, and, as a result, hospitals and sanatoria were to be found all over the German Empire.

Before proceeding to deal in detail with the plans illustrated, Mr. Hall made some preliminary remarks in regard to sites and types of buildings. In practically all the cases which he illustrated the sites selected had open prospects (broadly speaking toward the south), with shelter from the north, and with extensive areas for exercise: in other words, dry sites at bracing altitudes, aspects with the maximum of sunlight for patients' rooms, protection from chilling winds and sleet, and open-air living, were regarded as essentials for the reinvigoration of the invalid, while broad prospects were mentally stimulating, widening the interests in life and inculcating hope in the future. Pine woods as a screen were much appreciated for their exhilarating resinous aroma, and the sandy soil on which they thrived was considered the best on which a sanatorium could be situated.

EVOLUTION OF TYPES. — The earliest sanatoria were ordinary houses. Given the essential requisites of location, all that was sought was a place in which patients could sleep: disciplinary treatment was relied upon for the rest. A reputation for the cure being once established, buildings became larger as demands for accommodation increased, and many houses grew into hotels. Gradually the development of the sanatorium has led to a type with a corridor on the north and rooms on one side only.

Another branch of development has been the aggregation of small houses, first by the natural process of the acquisition of adjacent buildings, and later by a deliberate scheme of constructing small houses on the village principle, with central administrative buildings.

A third type is the large hospital with wide verandas on the south side of wards, where the open-air treatment is practiced by placing couches on the verandas, and on these the patients are reclined for eight or ten hours a day. Another ramification of the same idea, even with buildings specially erected as sanatoria, has been the construction of what in Germany are called, *liegehallen*, or reclining halls. These are generally one, but sometimes two-storied verandas enclosed on three sides, and open to the south; sometimes attached to, but often entirely separated from, the building proper. They are very general in Germany. Most of these buildings on the Continent are of three or more stories in height, as though the military idea of a barrack were the motive of the design adopted, and as experience taught the managers that the patient must come out of his nightly domicile, and could not be going constantly up and down stairs, provision had to be, and was, made for his resting during the day in shelters in the open air.

Hospitals are necessary for any advanced stages of consumption, but sanatoria are more particularly intended for, and are more successful with, early-stage cases of pulmonary tuberculosis. While, therefore, a hospital of three or four stories might be justified where sites were limited or concentration was considered imperative, sanatoria were better of one or two stories with verandas on the ground floor, and with such a type Mr. Hall considered *liegehallen* to be unnecessary.

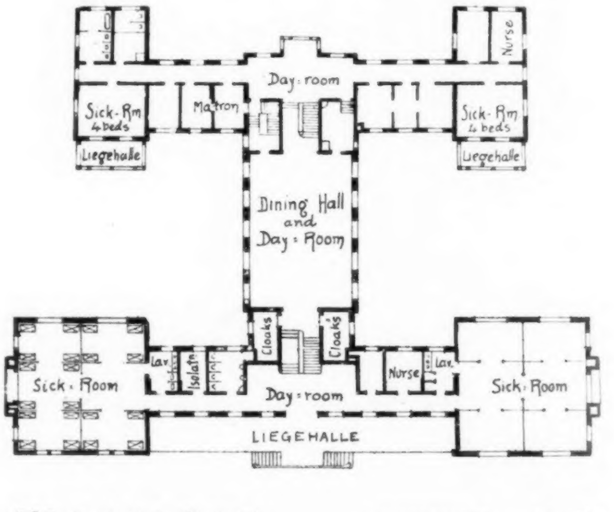
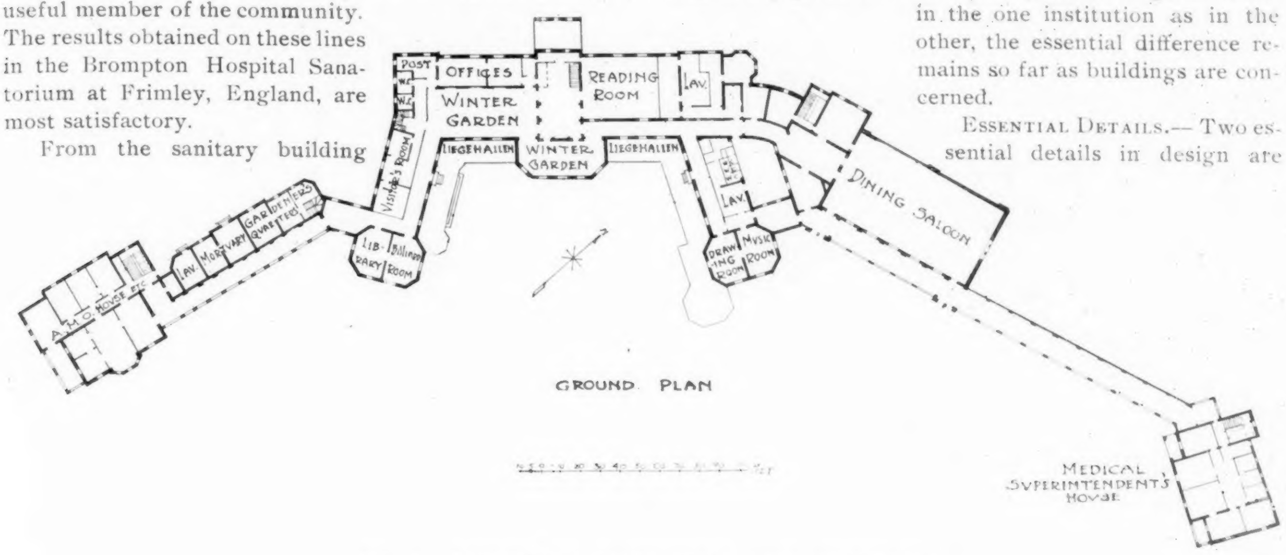


FIG. 2. EDMUNDSTHAL SANATORIUM, HAMBURG.

He believed, too, that the medical view is gradually coming to regard the treatment of keeping these patients lying down for many hours at a time as prejudicial to any permanent recovery and conducive to idle habits, and is in favor of regular and regulated exercise and employment, as in every way — physically and morally — better for the patient, and as educating him to become a more useful member of the community. The results obtained on these lines in the Brompton Hospital Sanatorium at Frimley, England, are most satisfactory.

From the sanitary building point of view, Mr. Hall said the long central corridor with rooms on both sides was not to be commended for patients, and even with one corridor sanitarians recommended that there should be ample windows in the outer wall of the corridor, with corresponding openings in the walls of the rooms, so that air might blow right through.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LAV.
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LIEGEHALLEN
WINTER GARDEN
LIEGEHALLEN
LAV.
DINING SALOON
GARDENERS QUARTERS
MORTUARY
LAV.
A. M. O. HOUSE ETC
LIBRARY
BILLIARD ROOM
DRAWING ROOM
MUSIC ROOM
GROUND PLAN
MEDICAL SUPERINTENDENT'S HOUSE

FIG. 3. SANATORIUM, FALKENSTEIN, NEAR FRANKFORT.

Merits of Buildings of One and Two Stories.— Of the relative merits of one and two-storied buildings this much may be said: the one-story is the easier and better for patients; the two-storied, in a large institution, gives better concentration for the staff. The former in a permanent building is the more expensive when foundations, roofs and sanitary apparatus are taken into account.

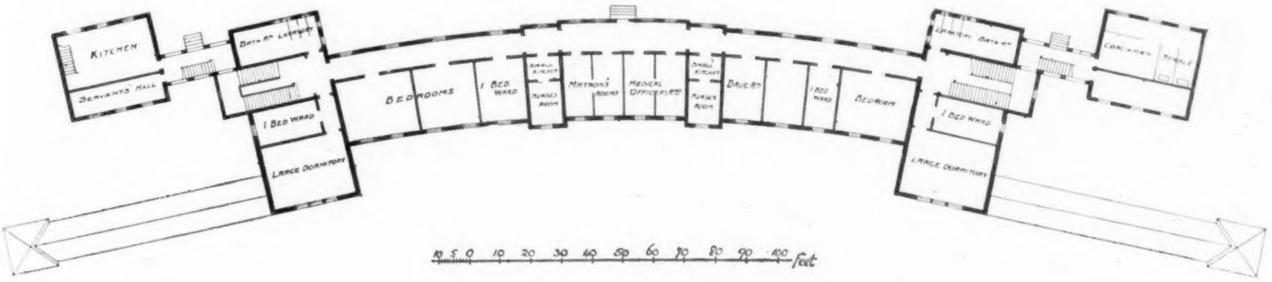

KITCHEN
SERVANTS' HALL
BATH RM LAVATORY
I BED WARD
LARGE DORMITORY
BEDROOMS
1 BED WARD
SMALL KITCHEN
NURSES ROOM
MATRONS' ROOMS
MEDICAL OFFICERS RMS
SMALL KITCHEN
NURSES ROOM
DAY RM
1 BED WARD
BEDROOM
LAVATORY BATH RM
I BED WARD
LARGE DORMITORY
COACHMAN
STABLE
10 5 0 10 20 30 40 50 60 70 80 90 100 feet

FIG. 4. SANATORIUM, RUPPERTSHAIN, NEAR KONIGSTEIN, GERMANY.

Cottage and Châlet Types. — There are many advocates of the cottage type of sanatoria as tending to greater classification, but that is an argument only of weight where other than first-stage cases are dealt with. The cottage has its advantages for paying patients, because greater privacy can thus be secured.

Much is heard, too, of the châlet type, or wood hut for a single patient, and its trifling cost as compared with a permanent sanatorium, but the two cannot be fairly compared. It would be as reasonable to compare the cost of a soldier's camp of tents or huts with that of a depôt barrack — the one is temporary, the other permanent.

The wood hut is primitive, and although medical skill may in any given individual case produce as good results in the one institution as in the other, the essential difference remains so far as buildings are concerned.

Essential Details.— Two essential details in design are (1) that all windows or other openings shall be carried up to the ceiling, so that all parts of the rooms and corridors may be scoured with fresh air; (2) sanitary apparatus should be external to the building.

It is considered that, with such provision, a minimum of 1,000 cubic feet for a single-bed ward was sufficient, and 9 feet to 10 feet ample height in such wards. Single-bed wards should be the rule, but two and three-bed wards were useful. In a hospital where all kinds of cases were taken the case was different, and in these, wards of eight to twenty beds were found.

Floors should not be laid direct on the ground, but should have a ventilated space beneath.

In rooms where windows are practically always open, no ventilating flues are necessary.

Varieties of Plan.— In the designs exhibited there were great varieties of plan. Some buildings were straight; some T-shaped; some crescents; some like an inverted U, the center straight, the arms opened out at angles from about 110° to 160°; some cruciform. For moderate-sized sanatoria, say under fifty beds, preference should be given to the open U plan. Care should be taken

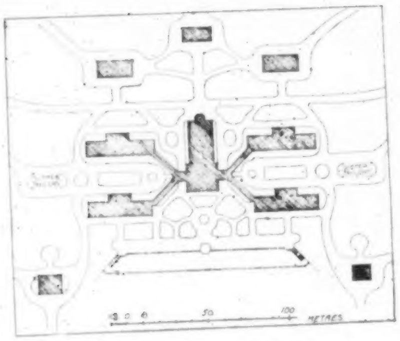


FIG. 5. BLOCK PLAN, OSTERASENS SANATORIUM, SWEDEN.

not to put too large a number of patients in one block or pavilion, because of the danger from a large fire. If the building were more than one story in height, there should be, as far as practicable, no way by which the vitiated air of the lower story might ascend to the upper one.

Mr. Hall then proceeded to describe the various sanatoria which he had examined.

### GERMAN SANATORIA.

**Beelitz**, near Berlin. — A large scheme, consisting of twenty main buildings and many smaller ones. The main pavilions are two-storied, E-shaped and patients' rooms mostly face south. Present accommodation, 308 patients.

**Belsig**, near Berlin. — A long two-storied building with axis east and west, the center being recessed, the whole forming an interesting and picturesque group. Accommodation, 125 patients.

**Badenweiler**. — Four-storied, and on plan an inverted T, the base, with east and west axis, containing the patients' bedrooms, and the perpendicular block containing the public rooms, etc.

**Meschede**. — Again a four-storied building with other rooms in the roof. On plan it is a crescent with southern aspect. Accommodation, 114 patients.

**Alberstsberg**. — A large building with a main corridor running east and west, with pavilions at right angles, those on the south side forming single wards of ten beds, each lighted on three sides, with *liegehallen* between them (Fig. 1). Those on the north side face east and west respectively, and contain on one floor six wards of three beds each, and one at the northeast of six beds. The public rooms are in the center, the dining-room connecting the main building to another parallel block at the rear. Accommodation, 121 patients.

**Edmundsthal**. — The main building for men (Fig. 2) is roughly H-shaped, the front block having two end pavilions, with windows on three sides, for twenty beds each, connected by a corridor having a *liegehalle* on its south side. A large central dining hall connects this block to a parallel one at the rear, in which are four-bed wards with their own balconies. There are other pavilions for women and children.

**Schreibershaw**. — Again a lofty building, the rooms in the center being in single file, those in the side blocks being in double file with a central corridor.

**Melsungen**. — Another lofty block, forming a very flat crescent, with center *liegehalle* on the upper floor and large dining hall behind.

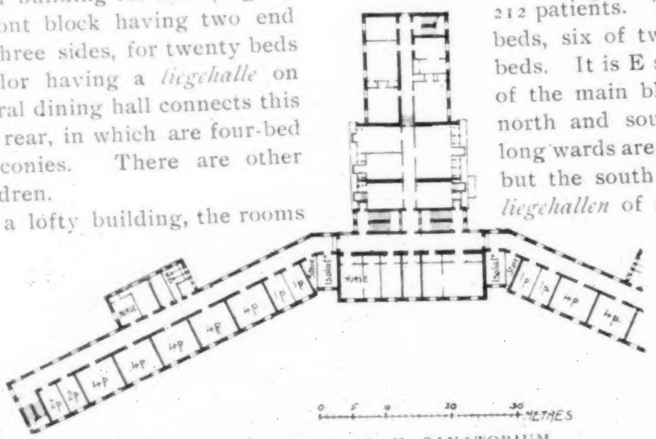
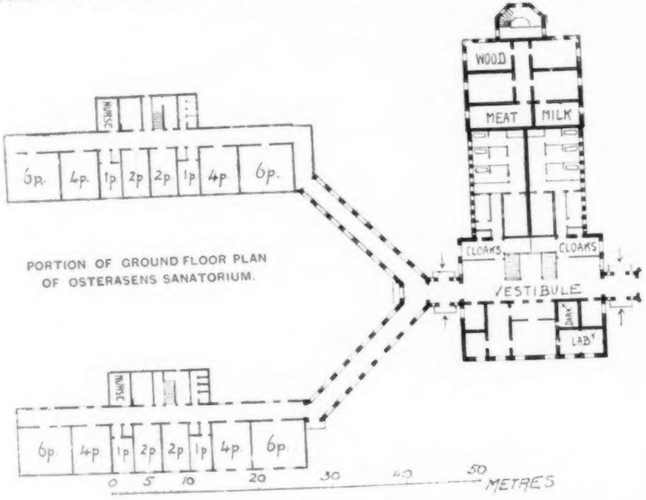


FIG. 6. FIRST FLOOR PLAN, SANATORIUM, HALAHULTS KRONOPARK, SWEDEN.

**Falkenstein**, near Frankfurt. — Four stories high. The nucleus of this sanatorium was a large private house, and its kitchens and offices are in the basement. Its plan (Fig. 3) has the public rooms in the center, with an east and west axis, and two wings with axis south-south-east and south-south-west. It will be seen that there is a central corridor with some bedrooms facing west, north-west and east-north-east. Accommodation, 120 paying patients of either sex, with seventy single and twenty-five two-bed rooms.

**Ruppertshain**, near Königstein. — Three stories in height, the main building crescent on plan (Fig. 4). It contains one hundred and twenty-two patients' beds, all facing towards south — ninety beds for men, thirty-two for women. There are six six-bed wards, seventeen four-bed and eighteen one-bed wards, all in single file south of a well-ventilated corridor. Its annex has further accommodation.



PORTION OF GROUND FLOOR PLAN OF OSTERASENS SANATORIUM.

**The Volksheilstatte Krailing**, near Planegg, Bavaria. — Accommodation, 120 patients. This sanatorium has a central block with east and west axis and two wings with east-south-east and south-south-west axis. There are thirteen single-bed wards, fourteen of two beds, six of three beds, two of four beds, six of five beds, and two of six beds, but more beds are occasionally used to accommodate the maximum number. Well planned.

**Harlaching**, near Munich. A large hospital for 212 patients. There are six wards of twenty beds, six of twelve, and some with single beds. It is E shaped on plan, with the axis of the main block east and west, the arms north and south. In the main block, the long wards are lighted from north and south, but the south side is shaded by balconies or *liegehallen* of solid masonry, 12 feet wide. This hospital is not exclusively for consumption.

It will be noted in most of these German sanatoria that the sanitary arrangements are most imperfect. Frequently, water-closets are in the heart of the building, in some cases three being in one room, lighted and ventilated by only one window, and having a door of access to the main passage. Sinks and lavatories are as badly placed.

### SWISS SANATORIA.

There are many sanatoria in Switzerland, but only that of Schatzalke is notable — a long parallelogram of four stories, with a central corridor from end to end. The principal floor is largely appropriated to the public rooms.

### SWEDISH SANATORIA.

Stockholm. — A large consumption hospital, designed ultimately to consist of 18 blocks of buildings, containing in all twelve hundred and forty-eight beds. There are three principal buildings, containing three hundred and eighty-four beds in each, in groups of eight to a ward. All wards are in single file, the corridor behind being wide and well ventilated. There are three stair-cases and there is a cloak-room on the ground floor, a very useful accessory. In another building there are forty beds, in wards of two beds each. Two summer pavilions have twenty-eight beds in each.

Osterasens (Fig. 5). — This sanatorium consists of one group of buildings, containing one hundred and four patients' beds. In the center is the administration, connected by four bifurcating arms to four parallel pavilions of one story each, containing two six-bed, two four-bed, two two-bed, and two one-bed wards. The defect of this plan was that the rear blocks looked on to the back of the front ones.

Halahults Kronopark (Fig. 6). — It contains on three floors one hundred and two patients' beds, with a central administration, having its axis north and south, and two wings facing south-east and south-west — one for men, the other for women. There are eighteen four-bed wards, the others being for two beds and one bed each. In addition to this main building, there are seven others, including two summer pavilions grouped around the first and largest.

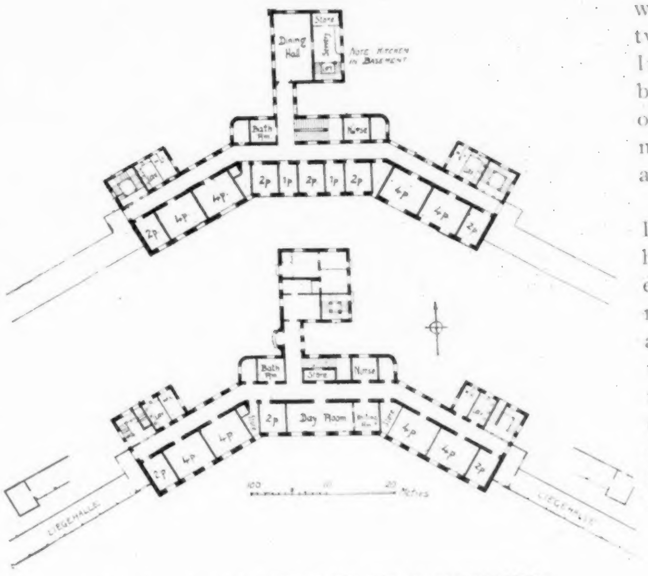


FIG. 7. A SWEDISH FIFTY-BED SANATORIUM.

Design for a Fifty-Bed Pavilion (Fig. 7). — This has a central block, with axis east and west, and patients' rooms in wings having their axes east-south-east and west-south-west, a type corresponding to that of Planegg, with *liegehallen* beyond the wings. This has eight four-bed wards, eight two-bed, and two one-bed wards.

### DUTCH SANATORIA.

Oranje-Nassaus Oord. — A semi-circle on plan (Fig. 8), with rooms in single file and *liegehallen* at intervals, forming a part of the design. It provides accommodation for patients on two stories, the wards facing south, east and west. There are excellent public rooms, the dining-room having windows on all sides.

Hoog-Laren. — A sanatorium for the city of Amsterdam. The building (of which the ground and first floors are shown in Figs. 9 and 10) is straight with a central corridor. The ground floor contains the administration and the patients' recreation rooms. The first floor contains eight single-bed wards, two four-bed wards, two six-bed wards, and two isolation wards of single beds opening on to a central balcony. The dining saloon and offices are at the rear, and a corridor connects the two blocks.

### FRENCH SANATORIA.

Angicourt (Oise) (Fig 11). — This sanatorium is in three hundred and twenty acres of grounds, and when completed will have three hundred and twenty-eight beds in two patients' blocks. It will be seen that it differs in plan from any of the others. It is, from a hygienic point of view, admirable in arrangement. Some of the administrative buildings lie on an axis north and south. To the right and left, near the northern end, are two others, while right and left of the southern end are the detached patients' buildings. Each

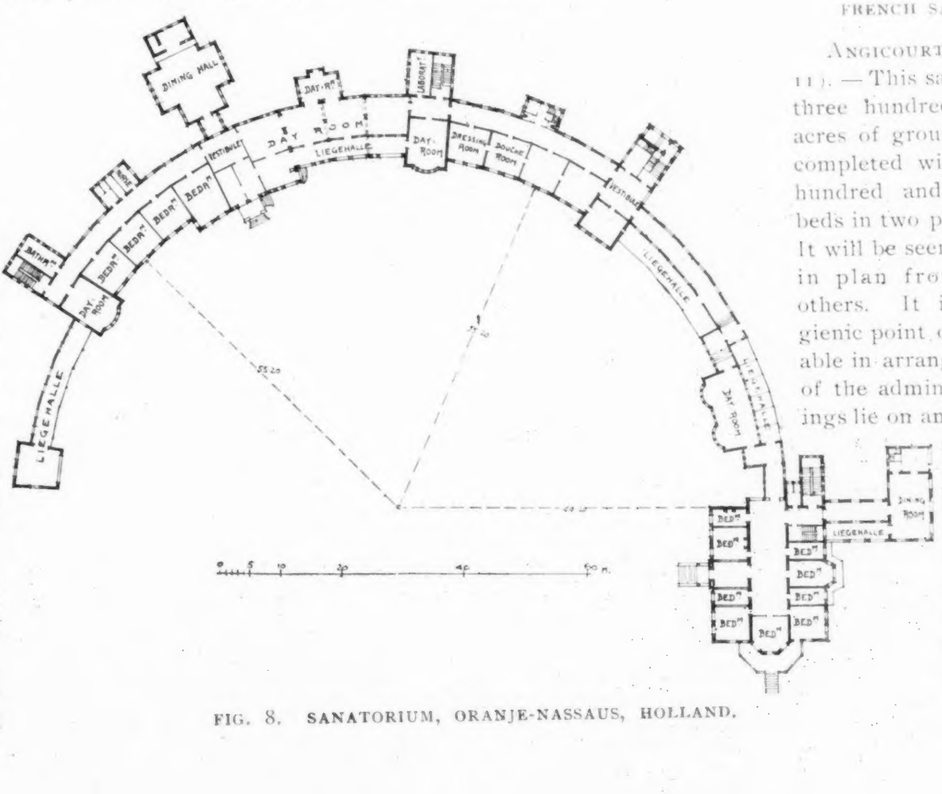


FIG. 8. SANATORIUM, ORANJE-NASSAUS, HOLLAND.

of these has a base with axis east and west, and wings with axes south-east and south-south-south-west. Each block contains one hundred and sixty-four beds in four wards of eight beds, twelve of five beds, twelve of three beds, and eighteen of two beds. On the ground floor a *galerie de cure*, the equivalent of the German *liegehallen*, extends all around the southern three sides of the enclosing building. A glass corridor connects the building to the dining hall.

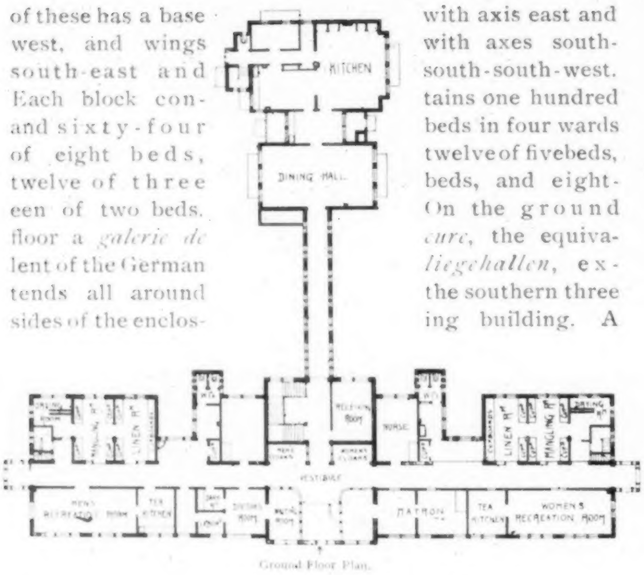

KITCHEN
DINING HALL
DRYING ROOM
MANGLING Rm
LINEN Rm
W.C.s
RECEPTION ROOM
NURSE
MEN'S CLOAKS
WOMEN'S CLOAKS
VESTIBULE
MEN'S RECREATION ROOM
TEA KITCHEN
DINING ROOM
MATRON
WOMEN'S RECREATION ROOM
CUPBOARDS
Ground Floor Plan.

FIG. 9. GROUND FLOOR PLAN.

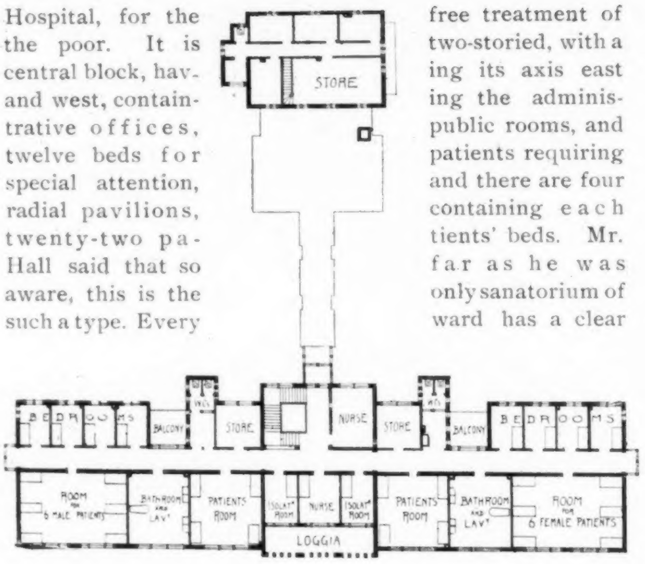

STORE
BEDROOMS
BALCONY
W.C.s
STORE
NURSE
ROOM FOR 6 MALE PATIENTS
BATHROOM AND LAVY
PATIENTS ROOM
ISOLATn ROOM
NURSE
LOGGIA
ROOM FOR 6 FEMALE PATIENTS

FIG. 10. FIRST FLOOR PLAN.

SANATORIUM, HOOG-LAREN, AMSTERDAM.

HAUTEVILLE (Ain). — A sanatorium for the city of Lyons. It is on a site having an altitude of three thousand feet, and contains one hundred and ten beds in three blocks of buildings (two stories high, with a basement), disposed on an arc of a circle open to the southwest. The wards are of one, two and three beds each. The baths, laundry, disinfector, kitchens and dining-rooms are in the basement — a scheme which is considered to be open to grave objection.

MONTIGNY-EN-OSTREVENT (NORD). — Designed by Professor Calmotte, of the Pasteur Institute. It is of the cottage type, consisting of a series of pavilions or houses, each for two families, one of whose members is suffering from tuberculosis. Another block is for contagious cases, and there are laboratories, etc.

### ENGLISH SANATORIA.

In England there are three sanatoria of one hundred beds each, which Mr. Hall mentioned in chronological order.

"HEATHERSIDE," FRIMLEY, Surrey (Fig. 12.) — This belongs to and was built (from designs by Mr. Hall) at the cost of the Brompton Consumption Hospital, for the free treatment of the poor. It is two-storied, with a central block, having its axis east and west, containing the administrative offices, public rooms, and twelve beds for patients requiring special attention, and there are four radial pavilions, containing each twenty-two patients' beds. Mr. Hall said that so far as he was aware, this is the only sanatorium of such a type. Every ward has a clear and undisturbed view of the open country, all being in single file, facing south, south-south-east, or south-south-west, with corridors on the northern side, and windows in walls and partitions for through currents of air.

The wards are forty-eight of one bed, eight of two beds, and twelve of three beds. The sanitary apparatus is all in detached towers. To the north of the patients' building are grouped the administrative buildings and recreation hall, and it has been sought to give all these the maximum of sunlight and air.

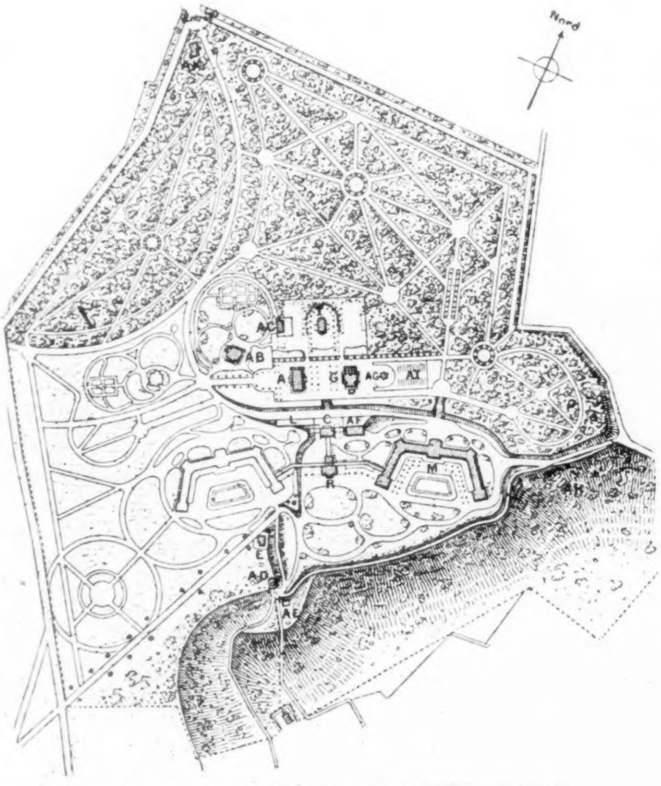

Nord
A
AB
AC
G
AG
AI
C
AF
R
M
E
AD
AE

FIG. 11. SANATORIUM, ANGICOURT, FRANCE.

A, Administration; G, Wash House; AG, Reservoir; AI, Drying Ground; AB, Doctor's House; AC, Stable; I, Mortuary; L, Workshop; C, Kitchen; AF, Engine House; R, Dining Hall; M, Patients' Building (164 Beds); E, Staff; AD, Fountain; AE, Water Tank; AK, Porter; AH, Septic Tanks.

NORTHWOOD (Middlesex). — This provides for one hundred and fourteen patients, fifty-seven of each sex, and there are ten beds in most of the wards, but there are twelve single-bed wards. Its plan of the main building has a small base, having east and west axis, for offices, and two wings two stories high, east-south-east and west-south-west with a wide paved terrace on the south. The administration is to the north.

THE KING'S SANATORIUM, MIDHURST. — This contains one hundred single-bed wards in one large building, three stories in height in the center, and two stories in the wings. All the rooms are in single file facing south, south-southeast, and south-south-west, with corridors to the north of them. The dining-hall, connected by a corridor, is to the north, and the administration and staff homes are in the west wing of this same block, the kitchen, etc., forming the east wing.

**Pinewood Sanatorium**, near Wokingham. — Designed for paying patients. It has a central administrative block and two detached two-storied wings, each containing thirty-two single-bed wards in single file, facing south-south-east and south-south-west. The dining-rooms, offices, nurses' and servants' quarters are to the north.

### INFIRMARY WARDS.

Mr. Hall showed plans of the consumption wards and provision for open-air treatment on the roofs of four pavilions designed by him as part of the Camberwell Infirmary, where the medical results obtained with consumptive patients are most satisfactory.

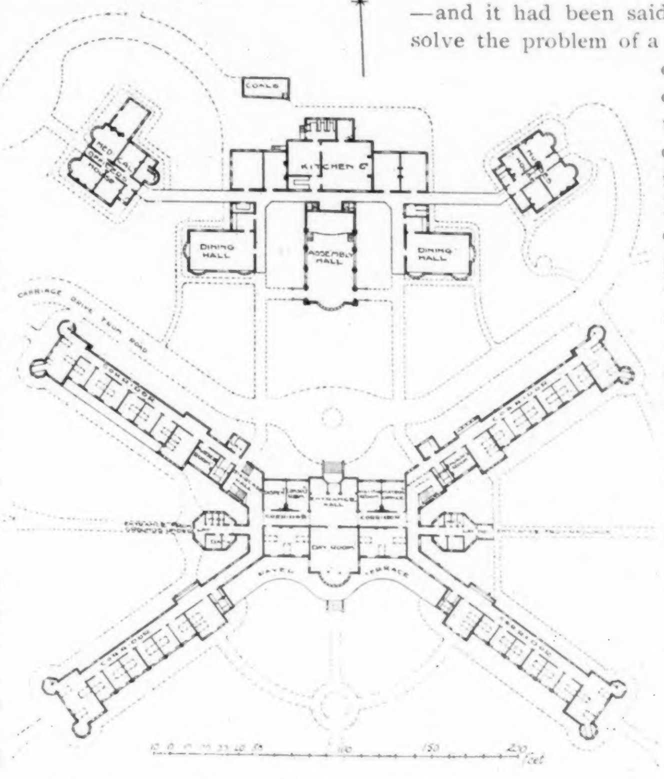

N
COALS
KITCHEN &
DINING HALL
ASSEMBLY HALL
DINING HALL
CARRIAGE DRIVE FROM ROAD
100
150
200
feet

FIG. 12. GROUND FLOOR PLAN, FRIMLEY SANATORIUM.
Edwin T. Hall, Architect.

### COST.

Cost of the various sanatoria had not been dealt with because a comparison between the several European countries was almost impossible, the rates of wages and prices of material differing very largely. A cubic basis of cost was illusory because manifestly rooms of large cube were cheaper per foot than those of smaller dimensions. The cost per bed was that usually adopted, and this had varied according to the type of design, the scope of the institution, the locality, etc., but for high-class permanent sanatoria the cost had ranged from $1,750 to $3,000 per bed, and even to over $5,000.

It was objected that the cost of all these institutions did not meet the want of sanatoria to be constructed all over the country for the million — in the literal sense — and it had been said that architects had yet to solve the problem of a design that could be carried out for complete institutions of varied size to suit local wants, at a cost that should commend itself to the guardians of the public purse. Huts, on the one hand, were cheap enough, but very temporary, and the maintenance was considerable; they had also special fire risks in wooded districts. At the other extremity was the solid building.

Mr. Hall said he had been giving a great deal of thought to the solving of the problem, and this has eventuated in the designs which he showed. The enclosing material, including that of floors, is non-combustible and impervious to rain and vermin. It is made in dry slabs of standard size, which are practically universal in application for the unit. A sanatorium on these lines, complete with all essential administrative buildings to suit any required number of beds, with drains, fittings to kitchen and laundry, and water storage, could be erected on a suitable and reasonably accessible site at a cost of about $425 to $525 per bed, depending on its size. As examples of what may be done, the plan (Fig. 13) shows a sanatorium of sixteen beds with its appropriate administration to cost about $8,400, and one of thirty-two beds to cost about $15,850.

This paper was first published in The Builders' Journal and Architectural Engineer, London.

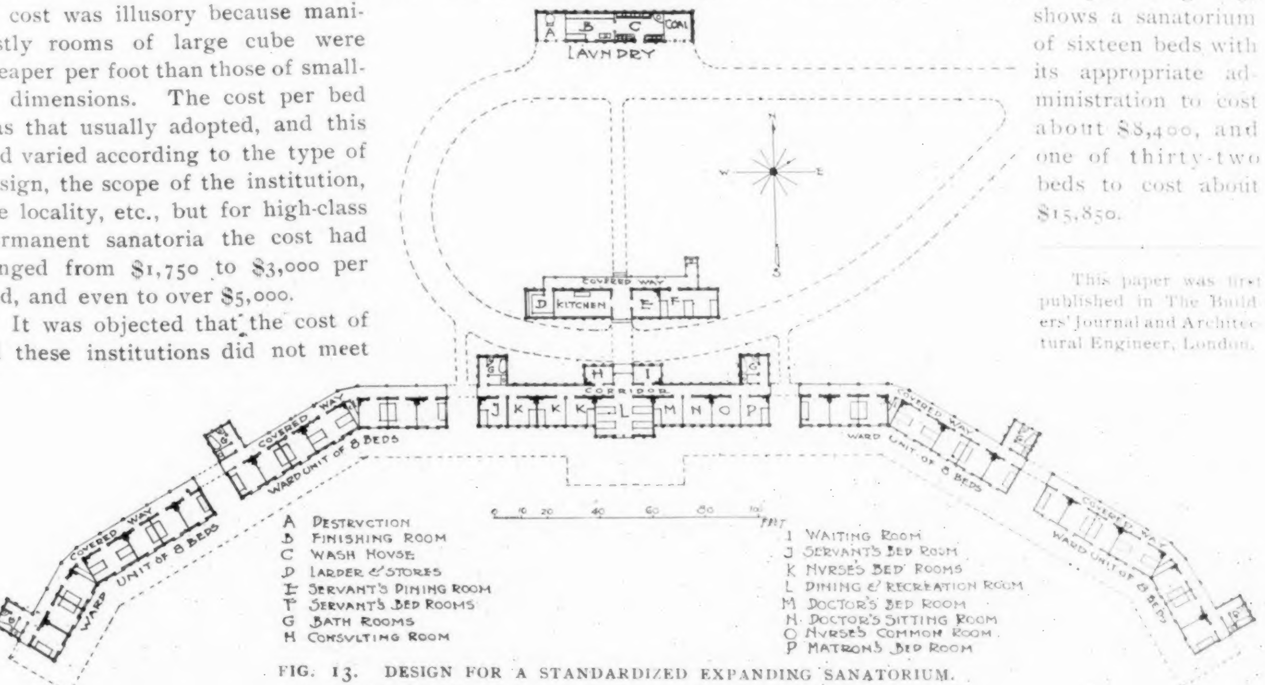

A
B
C
COAL
LAUNDRY
N
W
E
S
COVERED WAY
D
KITCHEN
E
F
G
H
I
CORRIDOR
J
K
K
K
L
M
N
O
P
G
COVERED WAY
WARD UNIT OF 8 BEDS
COVERED WAY
WARD UNIT OF 8 BEDS
COVERED WAY
WARD UNIT OF 8 BEDS
COVERED WAY
WARD UNIT OF 8 BEDS
0 10 20 40 60 80 100
FEET
A DESTRUCTION
B FINISHING ROOM
C WASH HOUSE
D LARDER & STORES
E SERVANT'S DINING ROOM
F SERVANT'S BED ROOMS
G BATH ROOMS
H CONSULTING ROOM
I WAITING ROOM
J SERVANT'S BED ROOM
K NURSE'S BED ROOMS
L DINING & RECREATION ROOM
M DOCTOR'S BED ROOM
N DOCTOR'S SITTING ROOM
O NURSES COMMON ROOM
P MATRON'S BED ROOM

FIG. 13. DESIGN FOR A STANDARDIZED EXPANDING SANATORIUM.
Costing about $425 to $525 per Bed. Edwin T. Hall, Architect.

# Strength of Brick and Brick Piers.*

THE results of tests of brick and brick piers, which I have the honor to present, are selected from those which have been made in the testing laboratory at the Watertown, Mass., Arsenal.

In this laboratory various kinds of constructive materials are tested, the results of which are published annually by the Ordnance Department, U. S. Army, in reports entitled "*Tests of Metals and Other Materials for Industrial Purposes*," Congressional documents for public distribution. Twenty-five volumes have thus far been published.

From these reports and from current tests, which will appear in subsequent volumes, certain results have been brought together, results which are thought to be representative of their respective kinds of material, as qualified by the explanatory remarks relating to them.

Bricks are possessed of those physical properties which are common to other materials of construction. That is, they have strength to sustain loads, elastic properties whereby their dimensions are slightly changed during the period of loading, springing back to their original shapes, or nearly so, when the loads are removed, they expand and contract with changes of temperature, and it appears that their volumes are slightly affected when saturated with water, swelling minutely but perceptibly when wet.

Properties inherent in individual bricks are reproduced in piers constructed therefrom, modified, however, by the properties of the mortar in which the bricks are laid, and mortars vary according to their composition and age. In general, the properties of constructive materials are found to present many variable elements, some of which are under control, and some are not.

Passing at once to the subject of individual brick, values for the coefficient of expansion by heat have been observed over a range from .0000020 to .0000074 per unit of length per degree Fahrenheit. An ordinary value would be in the vicinity of 30 to 40 ten-millionths, that is, somewhat less than steel, which has a value of a little above .0000060.

In making these determinations, the bricks were heated in water baths, basing the value of the coefficients upon the contractions displayed in passing from the bath of boiling water to one at about freezing temperature. It was necessary to use the measurements taken on falling temperatures, to eliminate the effect of the swelling of the bricks due to absorption of water.

The bricks usually swelled and were longer on the gauged lengths when in water at 33 degrees Fahrenheit than originally, when dry and in the air at 68 degrees. Moreover, after having been through the hot-water bath and returned to the cold one, their lengths were found still further increased.

When a brick saturated with water is frozen, it expands, due to the action of the water within. The amount of such expansion, in going from 33 degrees Fahrenheit down to, say, 25 degrees, measured on a length of six inches, has been found to range from a few ten-thousandths of an inch to above one-half a hundredth of an inch. Not infrequently, freezing a brick saturated with water is attended with a permanent increase in its length.

The elastic properties of brick have been observed, measuring the compressibility of the material as loads are applied, and determining the permanent sets when such have been acquired. Light-hard and salmon brick are most compressible — hard-burnt and vitrified brick are least compressible.

The moduli of elasticity, deducting the permanent sets in computing these values, range from less than 1,000,000 to a maximum of 10,000,000 pounds per square inch. Permanent sets, when they occur, are usually of small magnitude. From this it follows that the curves of compressibility are nearly straight lines; that is, in individual cases the amount of compression of a brick is nearly proportional to the load which is placed upon it.

The compression of the brick, in the direction in which the load is applied, is accompanied by an expansion in a lateral direction, which, as well as the direct compression, is a measurable quantity. The usual ratio of lateral expansion to longitudinal compression falls between the limits of 1-5th and 1-10th.

Density of structure is shown by the amount of water which a brick will absorb. Usually the absorption is reported in percentage by weight. A better method seems to be, to judge of the voids by the volume of water absorbed. Water enters a porous brick very promptly, less rapidly in the harder ones, but complete saturation is not accomplished even at the end of a week's immersion. Additional water is absorbed by exposure in a bath of hot water.

The compressive strength of brick extends over a wide range in values. The weight per cubic foot of the material, its density of structure, modulus of elasticity and compressive strength are mutually dependent features, and all are influenced more or less by the conditions of manufacture. The records of tests on compressive strength are numerous and generally available to all. "*Reports of Tests of Metals*," 1894, and following years, contain many such results. Nearly 500 state, territorial and other libraries are designated depositories for Congressional documents, where these volumes may be examined by those who do not have them personally.

The accompanying diagrams have been prepared to illustrate features connected with the properties of brick, brick piers and other materials of construction.

(No. 1.) The rate of absorption of some dry-pressed and mud brick, which were burned side by side in a down-draught kiln, is here shown.

The mud bricks are shown by full lines, the dry-pressed by dotted ones. These samples were weighed at frequent intervals during the early stages of immersion. It appears that a considerable part of the water eventually absorbed entered some of the samples during the first fifteen seconds of immersion. After this time absorption went on slowly. The upper horizontal lines indicate the amounts which were absorbed at the expiration of a week's time. The lesser amounts of water absorbed by the bricks from the top of the kiln over those farther down will be noted.

(No. 2.) On this diagram are shown the stress-strain curves of the samples of the preceding diagram. The greatest degree of rigidity is displayed by those from the

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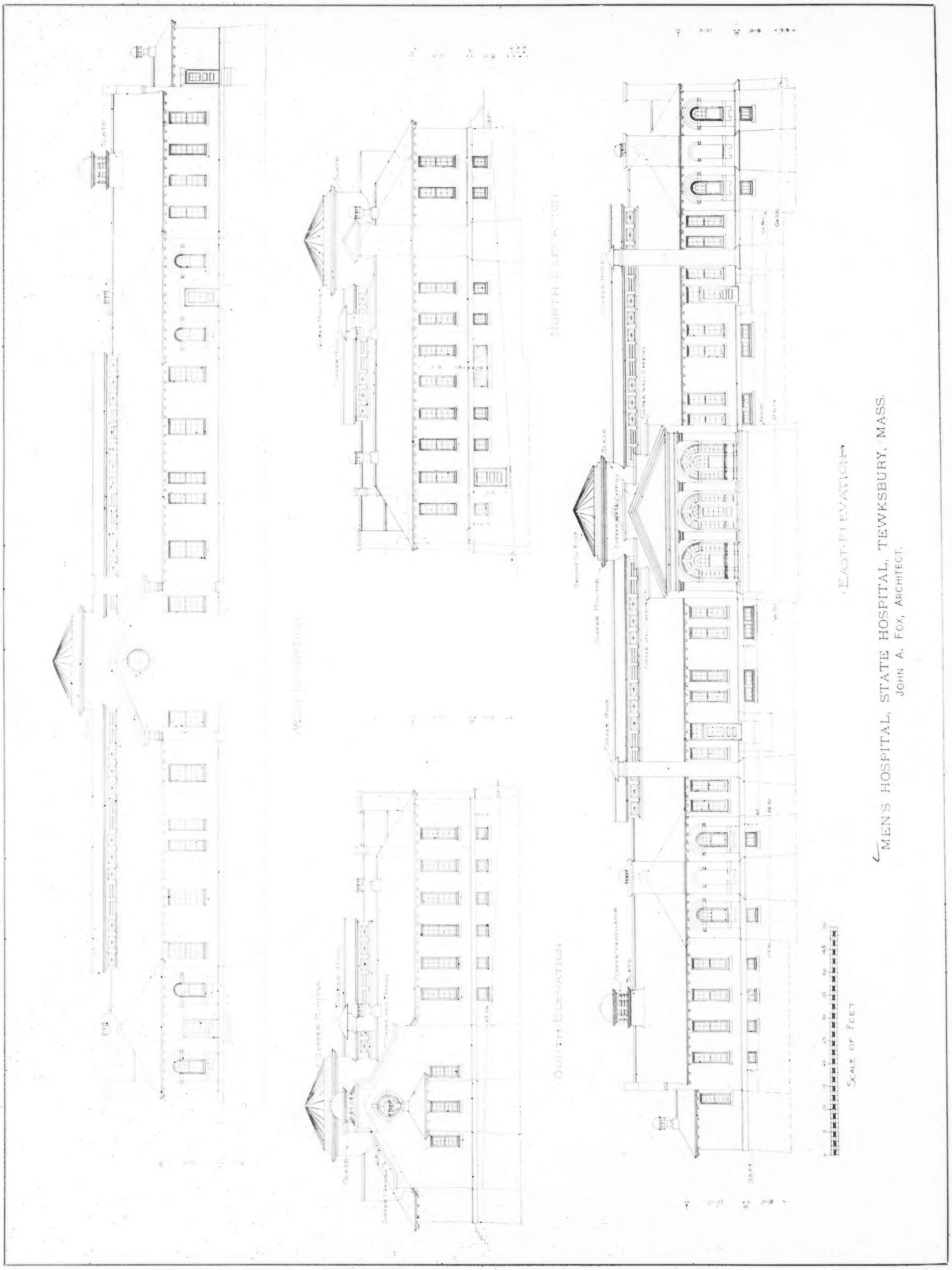
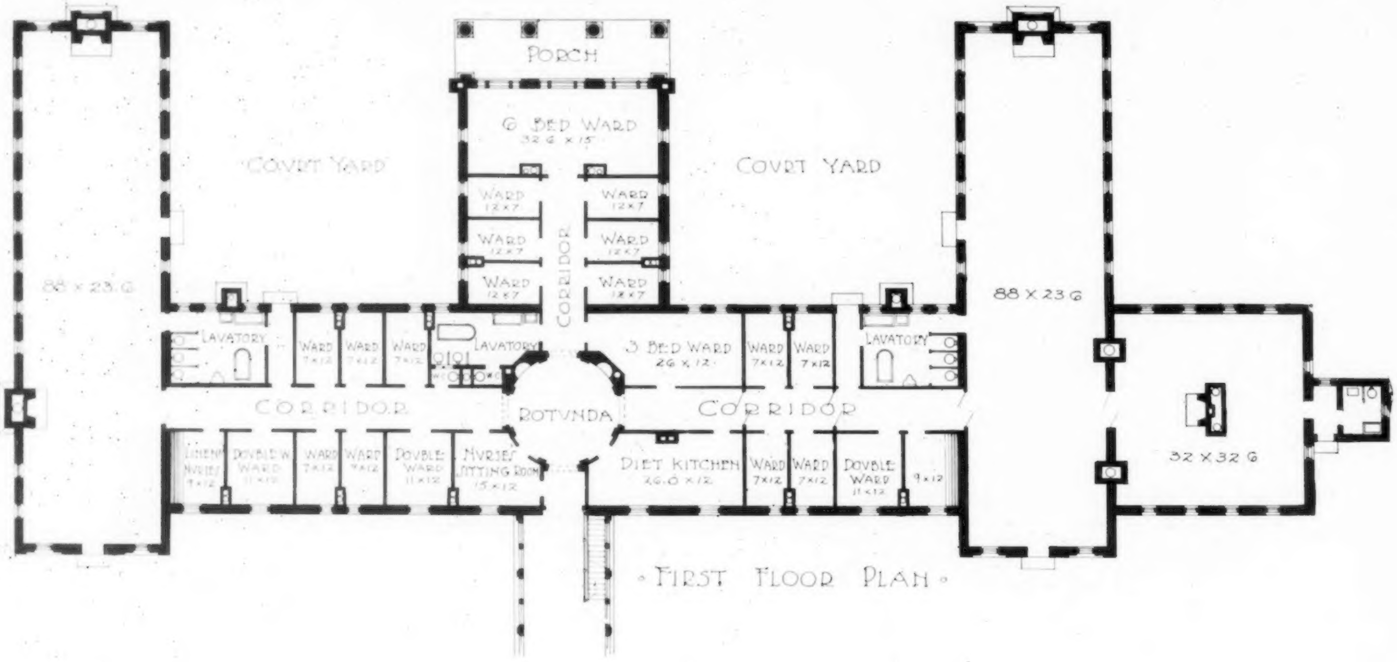
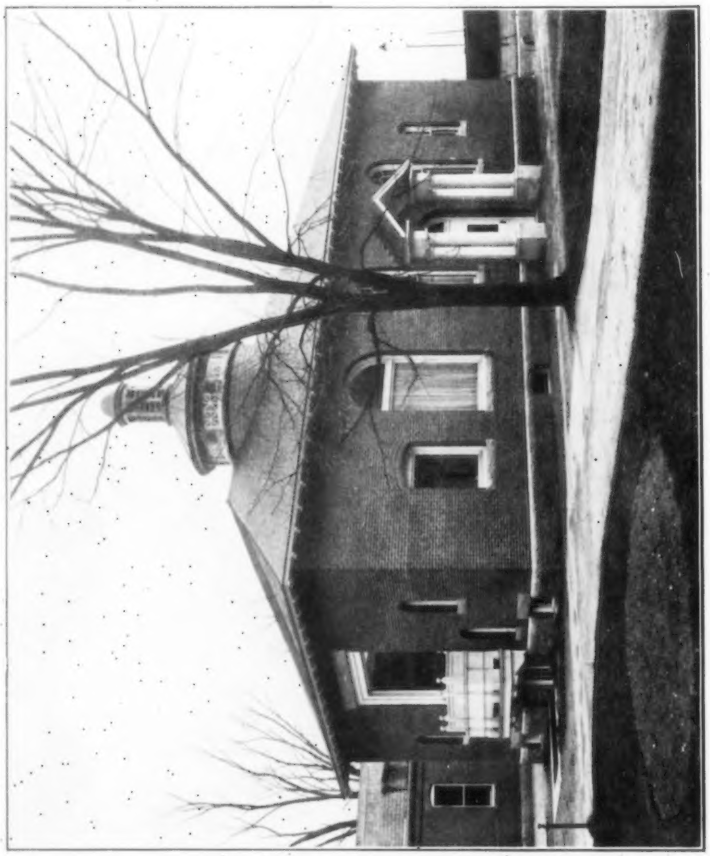
* Paper presented at the Twenty-first Annual Convention of the National Brick Manufacturers' Association, at St Louis, Mo., February 7, 1907, by James E. Howard.

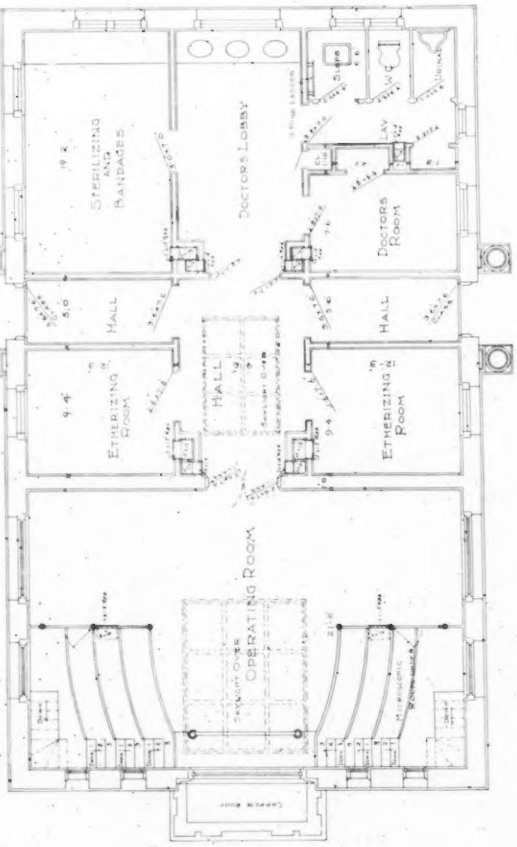

WEST ELEVATION
NORTH ELEVATION
SOUTH ELEVATION
EAST ELEVATION
SLATE
COPPER MOULDING
SCALE OF FEET

MEN'S HOSPITAL, STATE HOSPITAL, TEWKSBURY, MASS.
JOHN A. FOX, ARCHITECT.


PORCH
6 BED WARD
32.6 x 15
COURT YARD
COURT YARD
WARD 12x7
WARD 12x7
WARD 12x7
WARD 12x7
WARD 12x7
WARD 12x7
CORRIDOR
88 x 23.6
88 x 23.6
LAVATORY
WARD 7x12
WARD 7x12
WARD 7x12
LAVATORY
3 BED WARD 26 x 12
WARD 7x12
WARD 7x12
LAVATORY
CORRIDOR
ROTUNDA
CORRIDOR
LINEN NURSES 9x12
DOUBLE WARD 11x12
WARD 7x12
WARD 7x12
DOUBLE WARD 11x12
NURSES SITTING ROOM 15x12
DIET KITCHEN 26.0 x 12
WARD 7x12
WARD 7x12
DOUBLE WARD 11x12
9x12
32 x 32.6
FIRST FLOOR PLAN

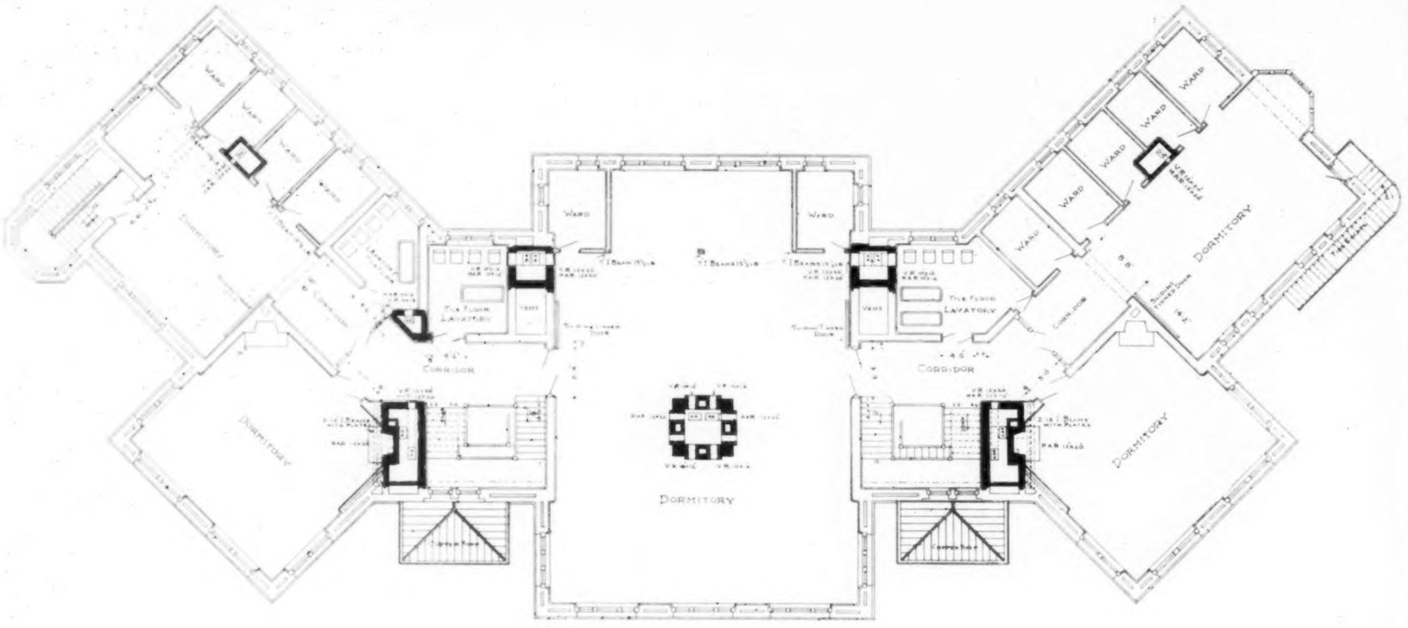
MEN'S HOSPITAL, STATE HOSPITAL, TEWKSBURY, MASS
JOHN A. FOX, ARCHITECT.



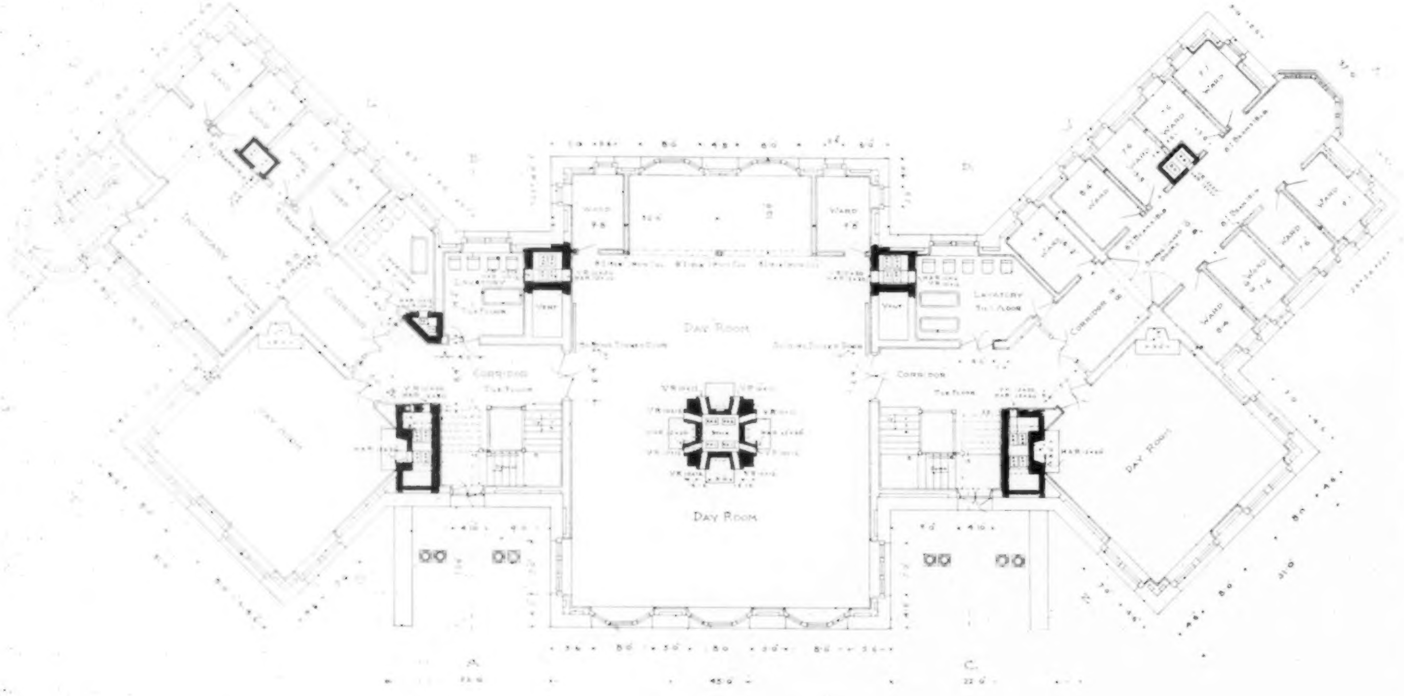

STERILIZING AND BANDAGES
DOCTORS LOBBY
DOCTORS ROOM
HALL
HALL
HALL
ETHERIZING ROOM
ETHERIZING ROOM
OPERATING ROOM

FLOOR PLAN

SURGICAL BUILDING, STATE HOSPITAL, TEWKSBURY, MASS.
JOHN A. FOX, ARCHITECT.

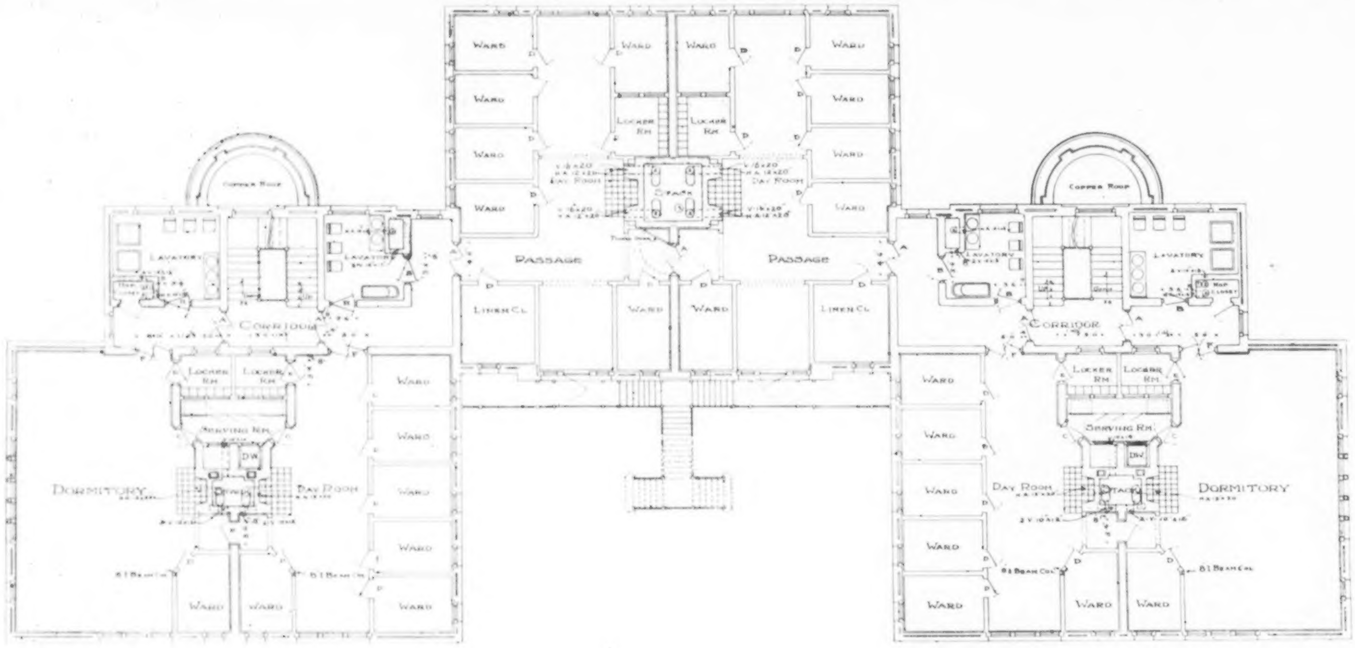

WARD
DORMITORY
CORRIDOR
TILE FLOOR
LAVATORY
VENT

SECOND FLOOR PLAN.

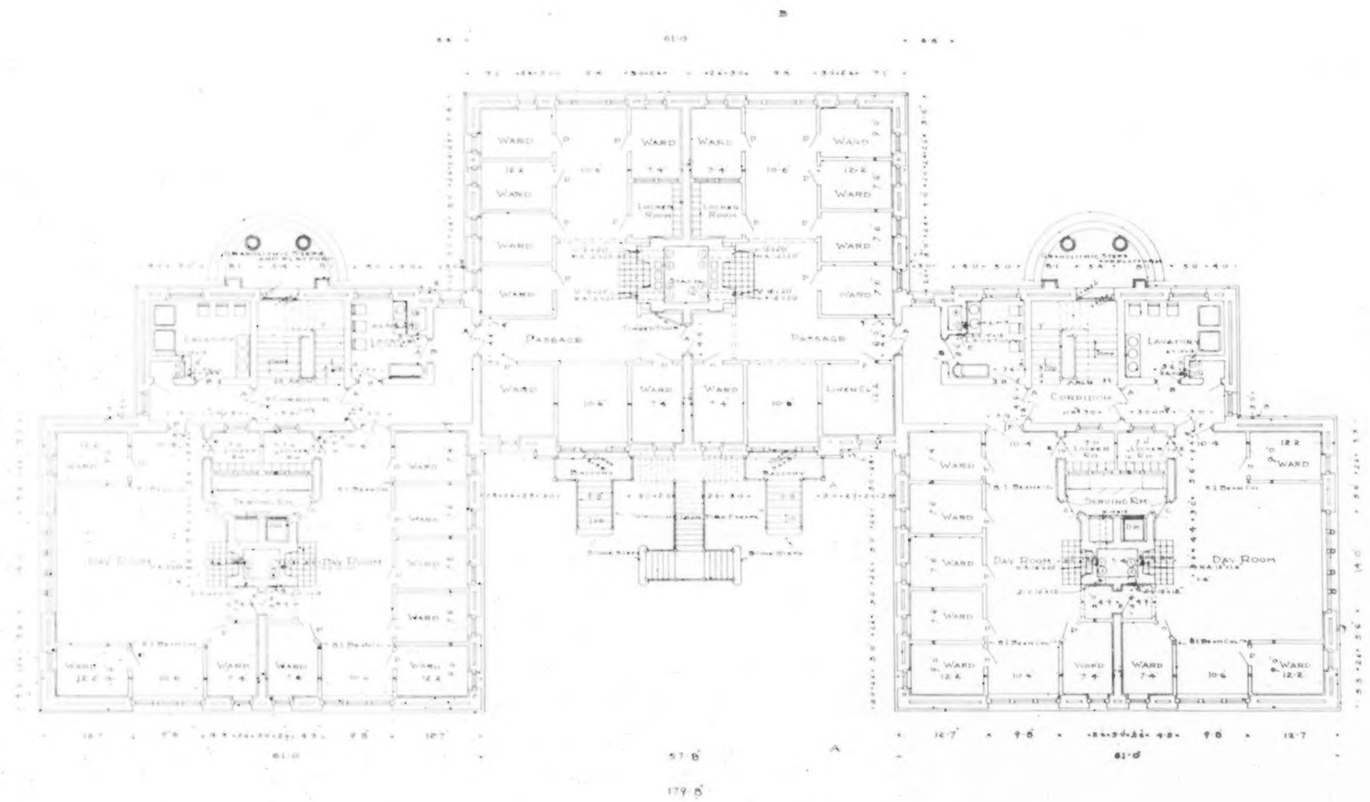

WARD
DAY ROOM
CORRIDOR
LAVATORY
TILE FLOOR
VENT
A
C

FIRST FLOOR PLAN.

MEN'S ASYLUM, STATE HOSPITAL, TEWKSBURY, MASS.
JOHN A. FOX, ARCHITECT.

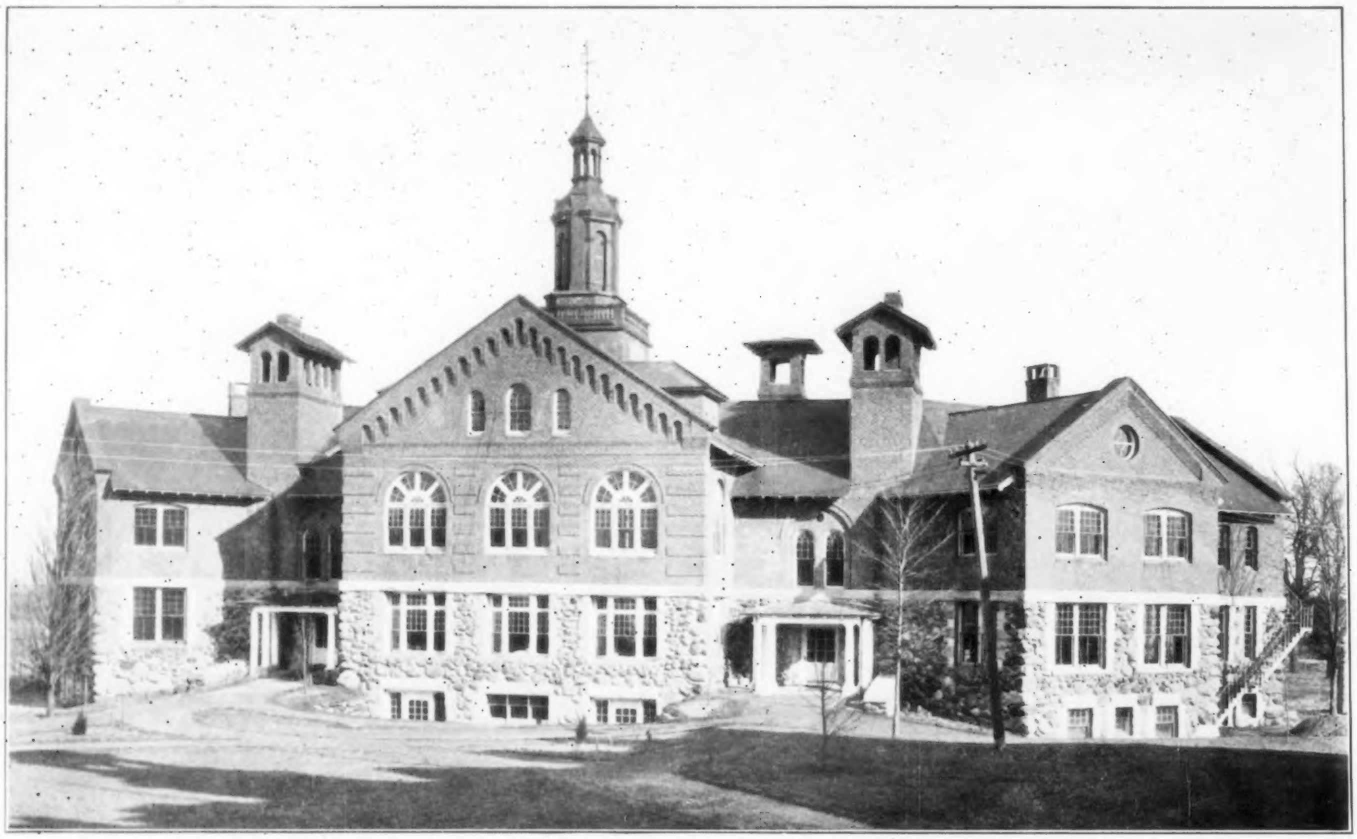

WARD
WARD
WARD
WARD
LOCKER RM
LOCKER RM
WARD
WARD
WARD
WARD
DAY ROOM
STAIRS
DAY ROOM
COPPER ROOF
COPPER ROOF
LAVATORY
LAVATORY
LAVATORY
LAVATORY
PASSAGE
PASSAGE
LINEN CL
WARD
WARD
LINEN CL
CORRIDOR
CORRIDOR
LOCKER RM
LOCKER RM
LOCKER RM
LOCKER RM
SERVING RM
SERVING RM
DW
DW
DORMITORY
DAY ROOM
DAY ROOM
DORMITORY
STAIRS
STAIRS
WARD
WARD
WARD
WARD
WARD
WARD
WARD
WARD
WARD
WARD
WARD
WARD
WARD
WARD
8" I BEAM

SECOND FLOOR PLAN.

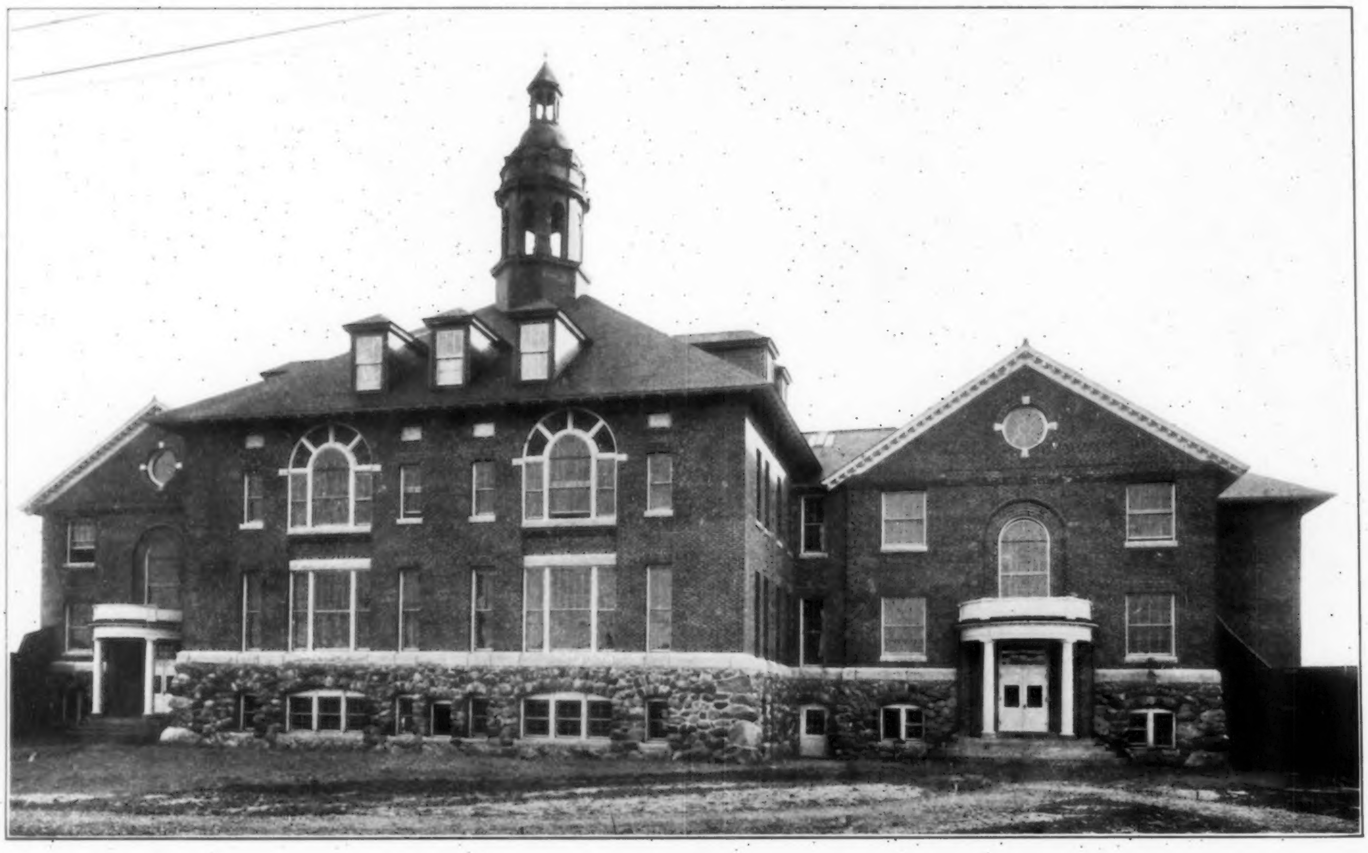

61'-0"
WARD
WARD
WARD
WARD
LOCKER ROOM
LOCKER ROOM
PASSAGE
PASSAGE
LAVATORY
LAVATORY
CORRIDOR
CORRIDOR
LINEN CL
SERVING RM
SERVING RM
DAY ROOM
DAY ROOM
DAY ROOM
DAY ROOM
STONE STEPS
STONE STEPS
8" I BEAM
WARD
12'-7"
61'-0"
57'-8"
179'-8"

FIRST FLOOR PLAN.

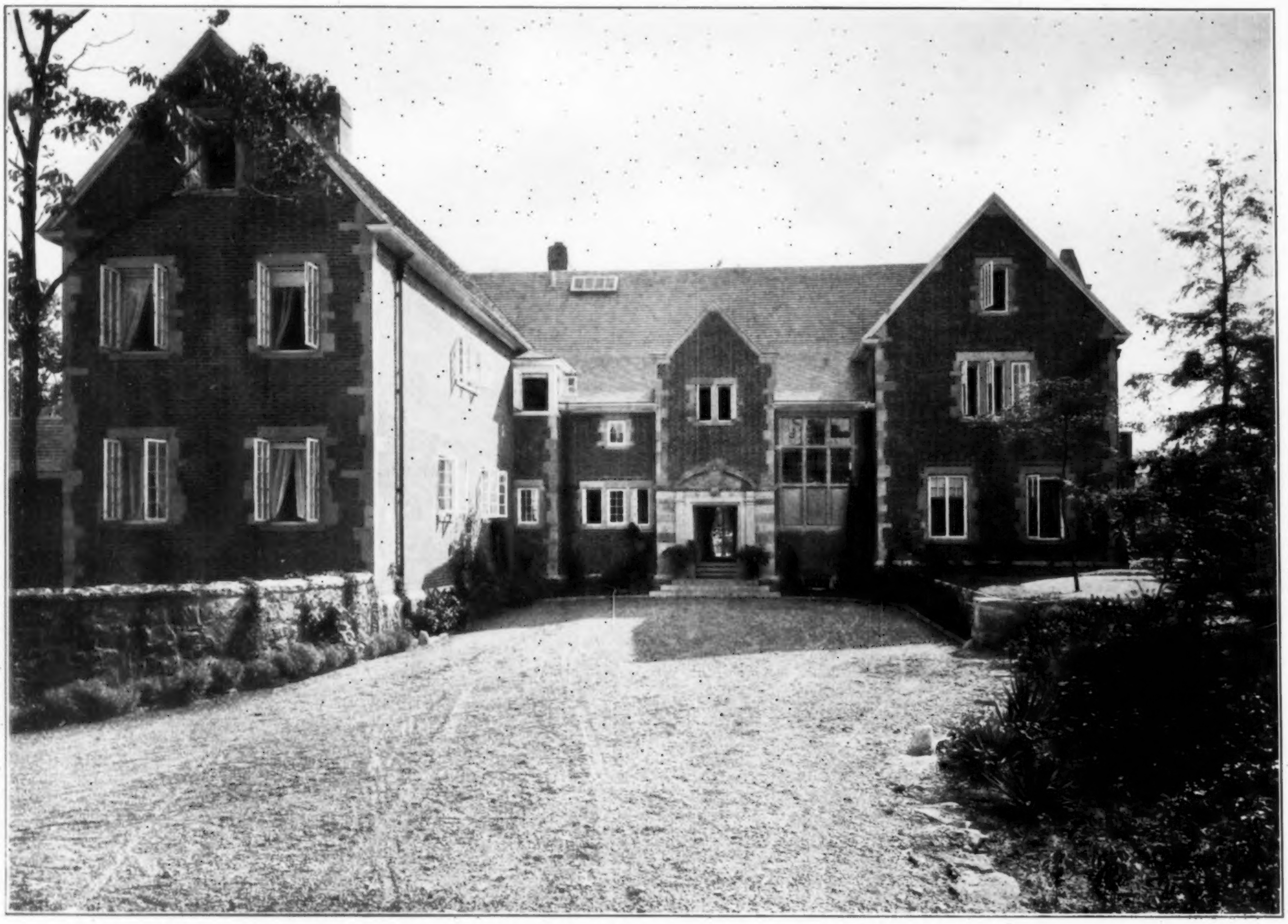
WOMEN'S ASYLUM, STATE HOSPITAL, TEWKSBURY, MASS.
JOHN A. FOX, ARCHITECT.



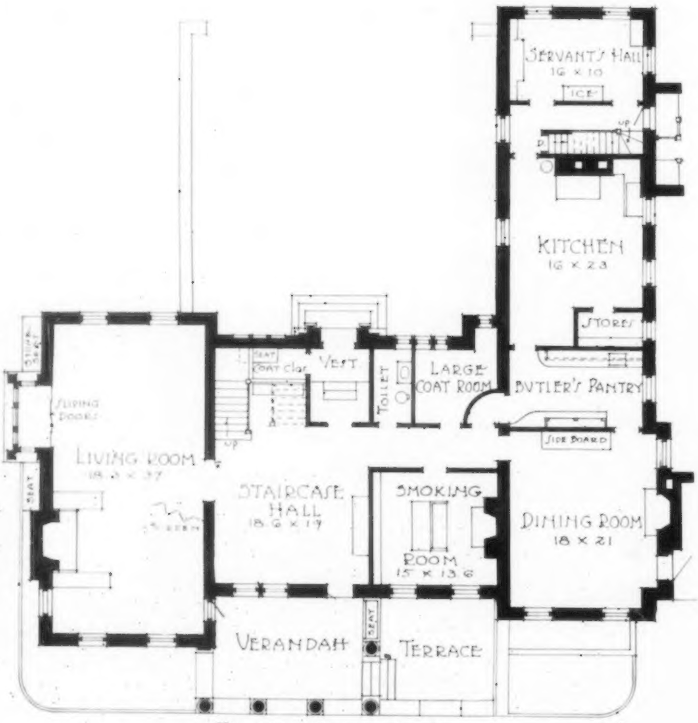
MEN'S ASYLUM, STATE HOSPITAL, TEWKSBURY, MASS.



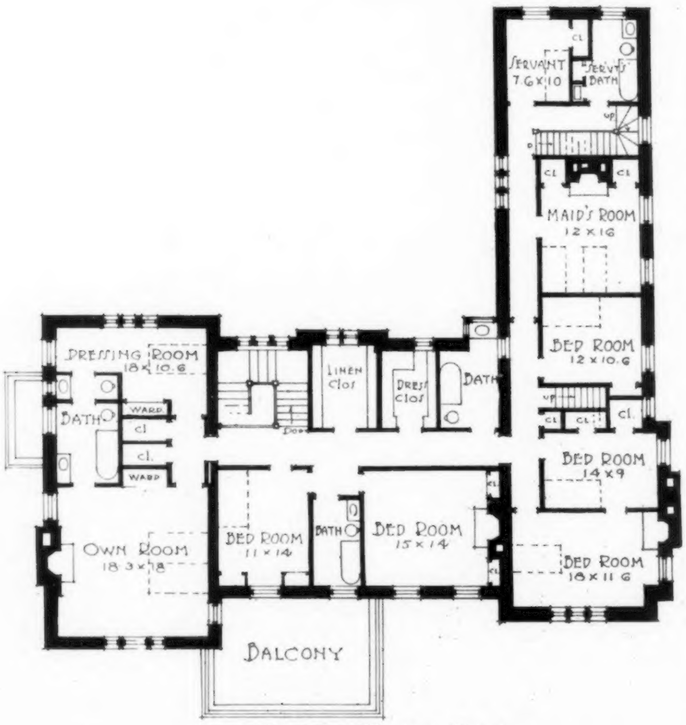
WOMEN'S ASYLUM, STATE HOSPITAL, TEWKSBURY, MASS.
JOHN A. FOX, ARCHITECT.



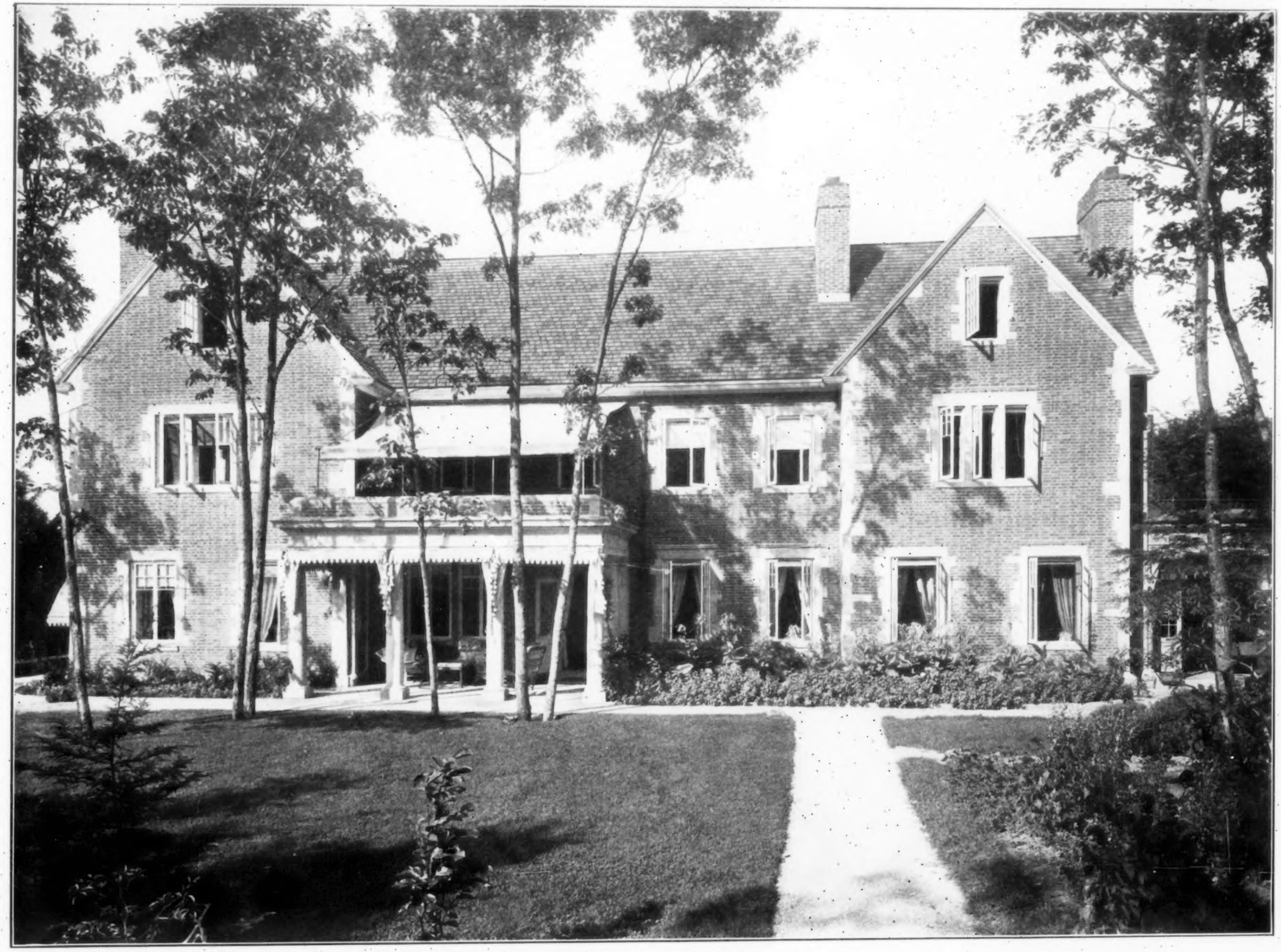
HOUSE FOR LEWIS STUYVESANT CHANLER, ESQ., TUXEDO PARK, N. Y.
STURGIS & BARTON, ARCHITECTS.


SERVANT'S HALL 16 x 10
ICE
UP
KITCHEN 16 x 23
STORES
BUTLER'S PANTRY
SIDE BOARD
LARGE COAT ROOM
TOILET
VEST
SEAT
COAT CLOS
UP
SLIDING DOORS
SEAT
LIVING ROOM 18.0 x 27
SCREEN
STAIRCASE HALL 18.6 x 17
SMOKING ROOM 15 x 13.6
DINING ROOM 18 x 21
VERANDAH
SEAT
TERRACE

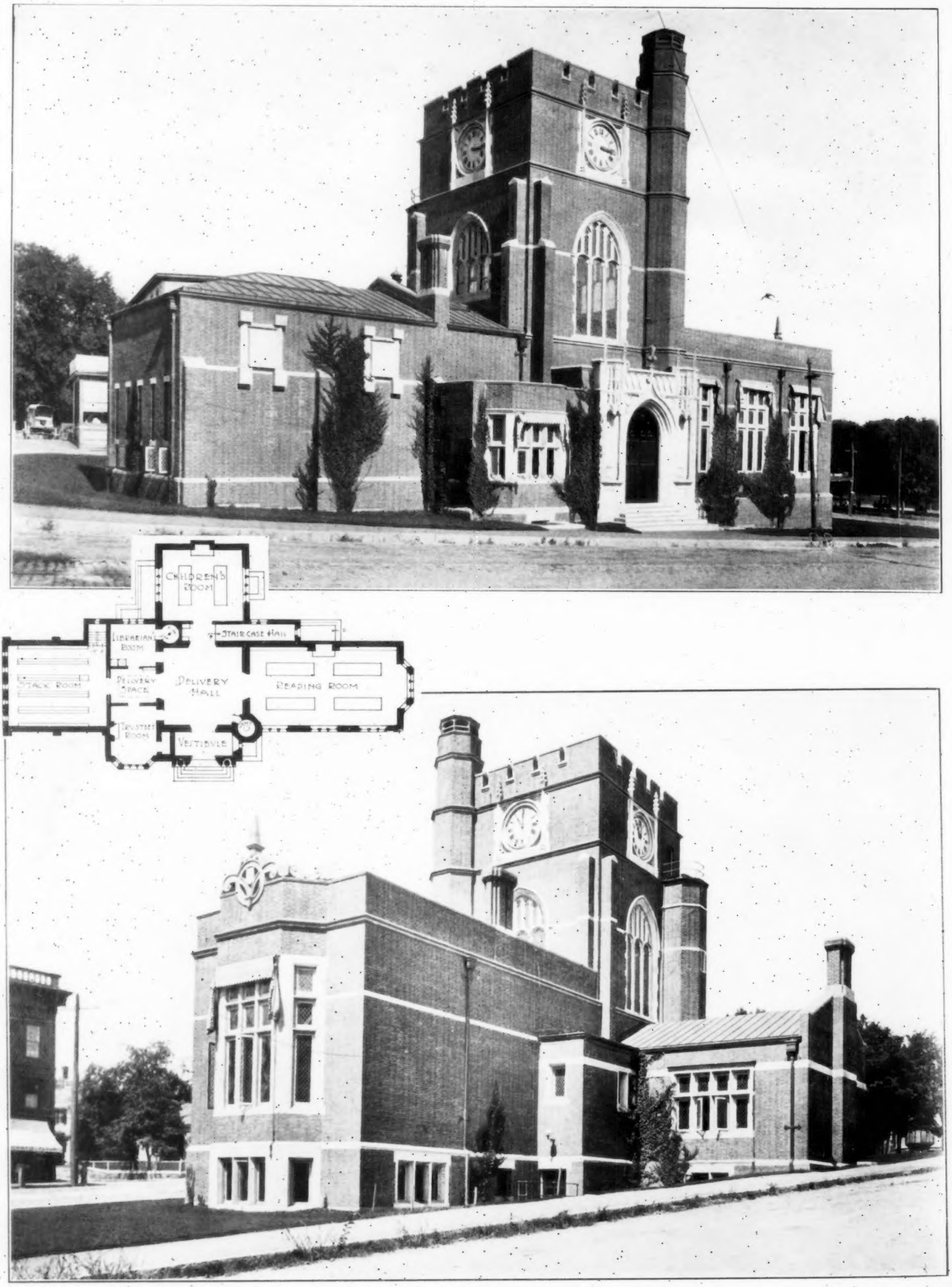
FIRST FLOOR PLAN


SERVANT 7.6 x 10
SERV'S BATH
CL
UP
CL
CL
MAID'S ROOM 12 x 16
BED ROOM 12 x 10.6
CL
CL
CL
BED ROOM 14 x 9
BED ROOM 18 x 11.6
DRESSING ROOM 18 x 10.6
BATH
WARD
CL
WARD
LINEN CLOS
DRESS CLOS
BATH
OWN ROOM 18.3 x 18
BED ROOM 11 x 14
BATH
BED ROOM 15 x 14
BALCONY

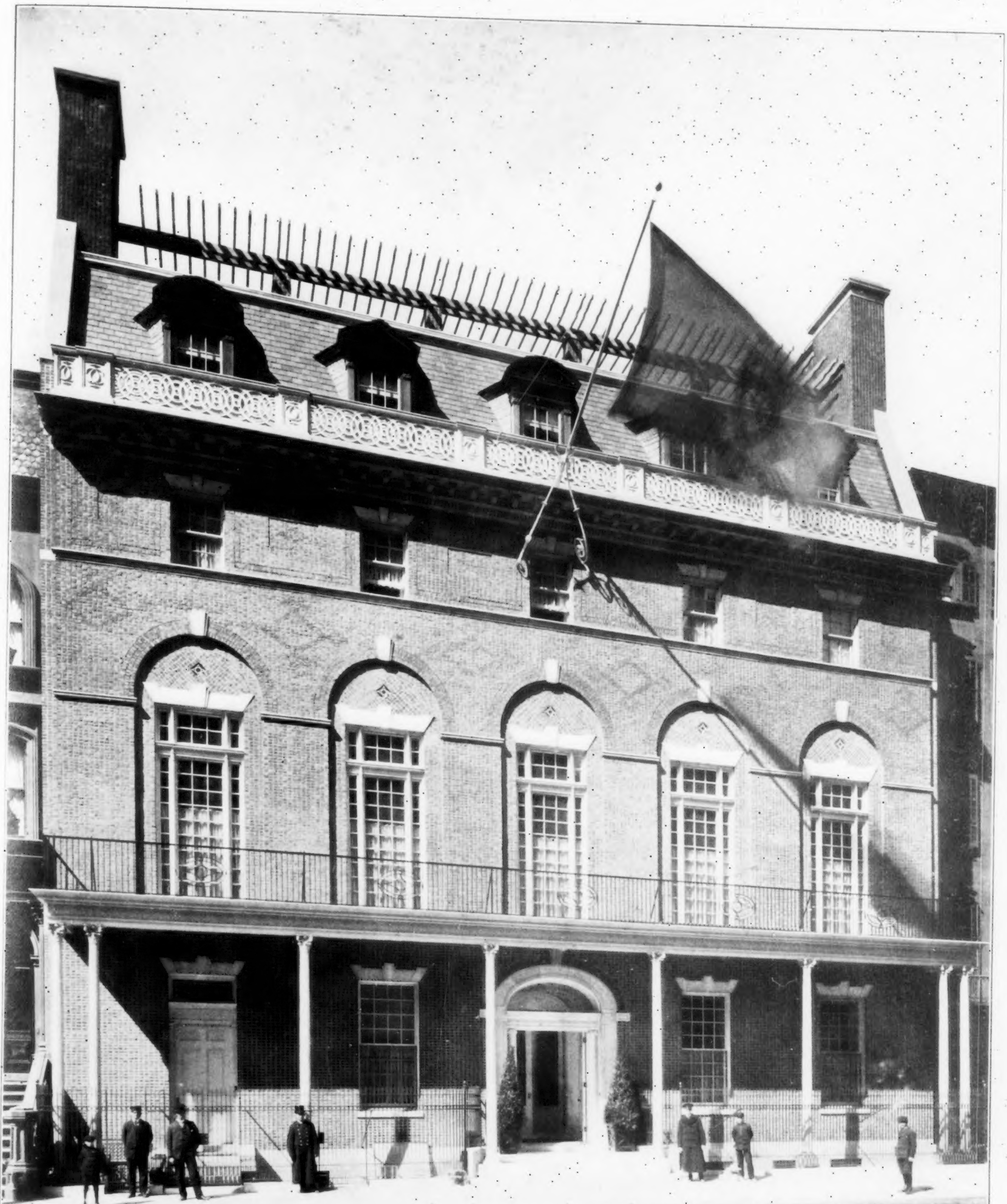
SECOND FLOOR PLAN



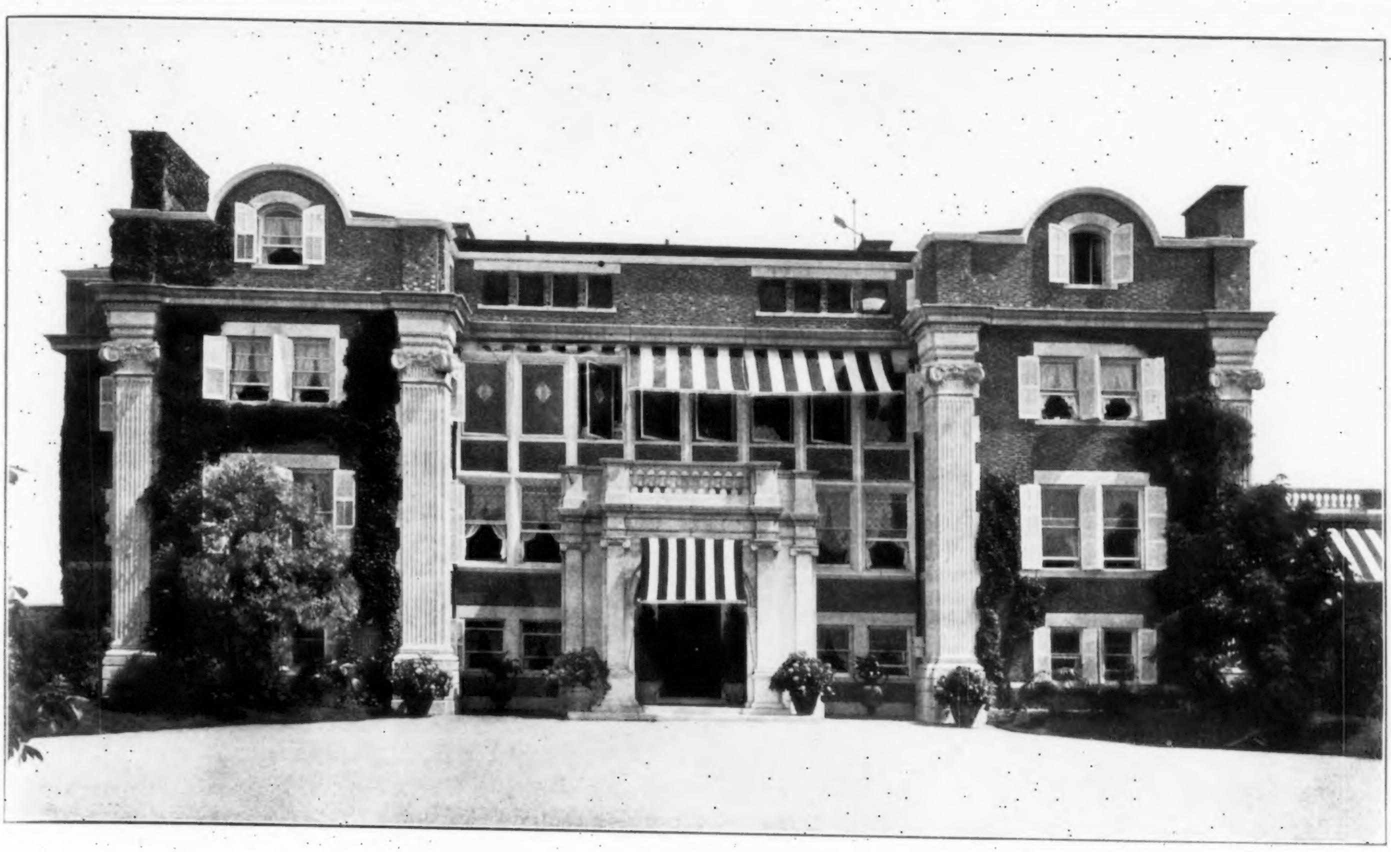
HOUSE FOR LEWIS STUYVESANT CHANLER, ESQ., TUXEDO PARK, N. Y.
STURGIS & BARTON, ARCHITECTS.


CHILDREN'S ROOM
LIBRARIAN ROOM
STAIRCASE HALL
STACK ROOM
DELIVERY SPACE
DELIVERY HALL
READING ROOM
TRUSTEES ROOM
VESTIBULE

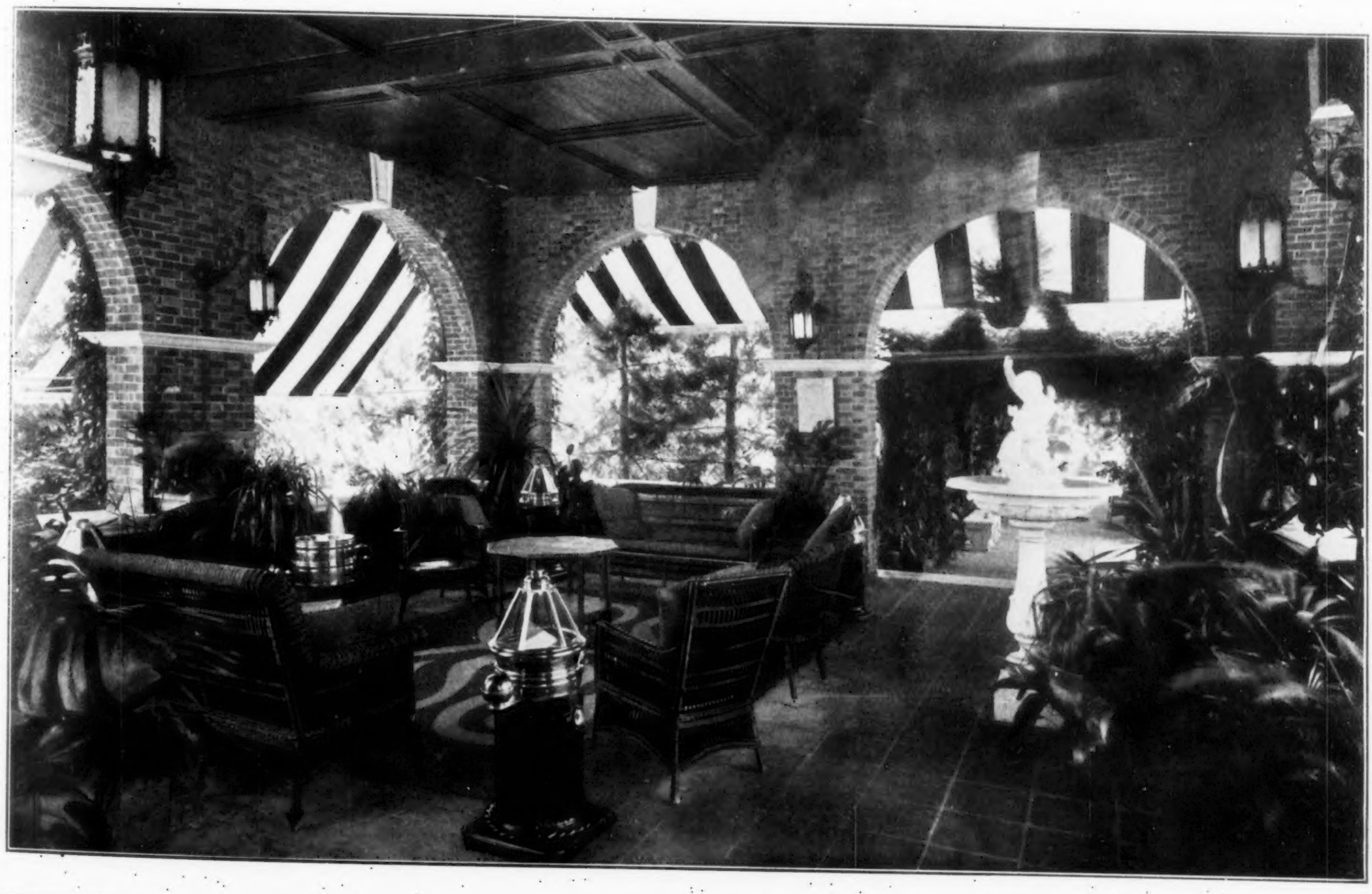
LIBRARY AT NASHUA, N. H.
CRAM, GOODHUE & FERGUSON, ARCHITECTS.

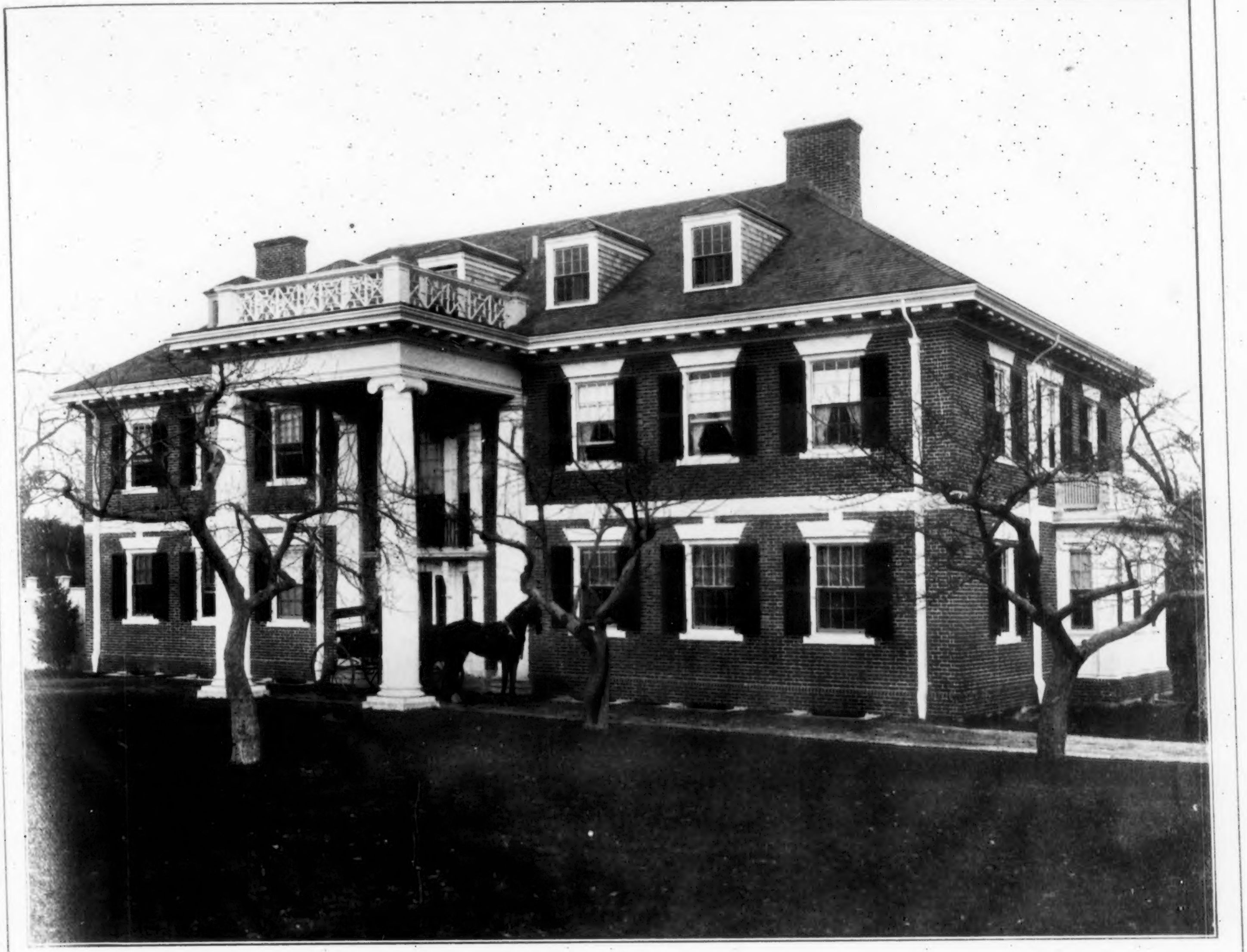


√ THE COLONY CLUB, MADISON AVENUE, NEW YORK.
McKIM, MEAD & WHITE, ARCHITECTS.



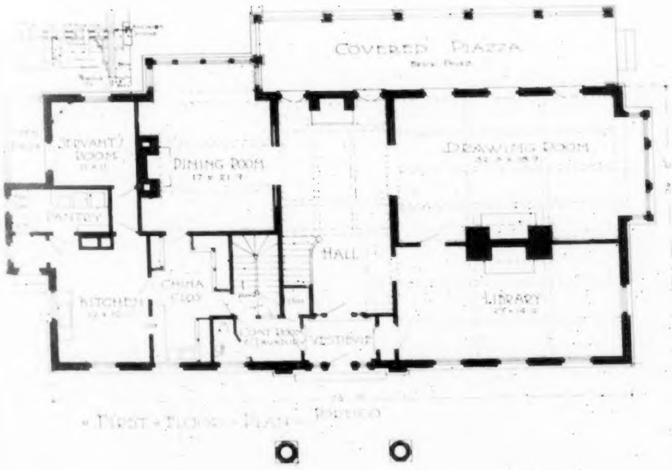
HOUSE FOR C. OLIVER ISELIN, ESQ., NEW ROCHELLE, N. Y.
SIDNEY STRATTON, ARCHITECT.



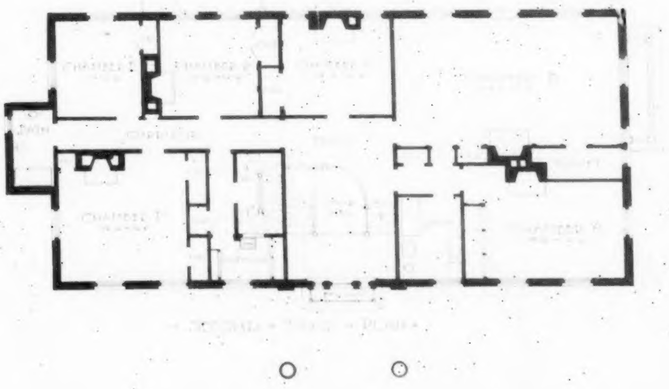


# HOUSE FOR S. T. HUTCHINSON, ESQ., DEDHAM, MASS.

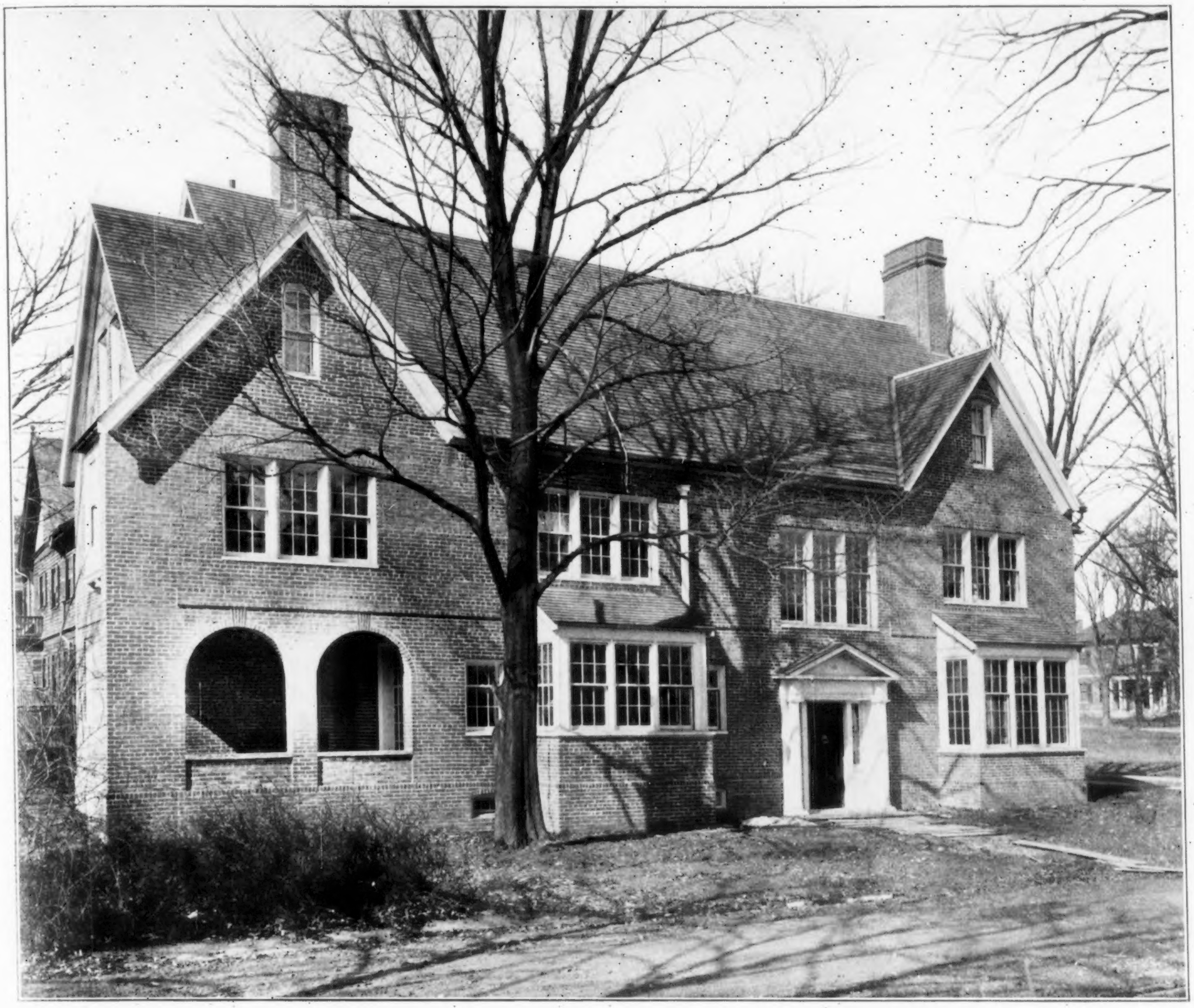
PHILIP B. HOWARD, ARCHITECT.


COVERED PIAZZA
BRICK FLOOR
SERVANT'S ROOM
DINING ROOM
17 x 21-7
DRAWING ROOM
PANTRY
HALL
CHINA CLOS
KITCHEN
LIBRARY
COAT ROOM & LAVATORY
VESTIBULE
PORTICO

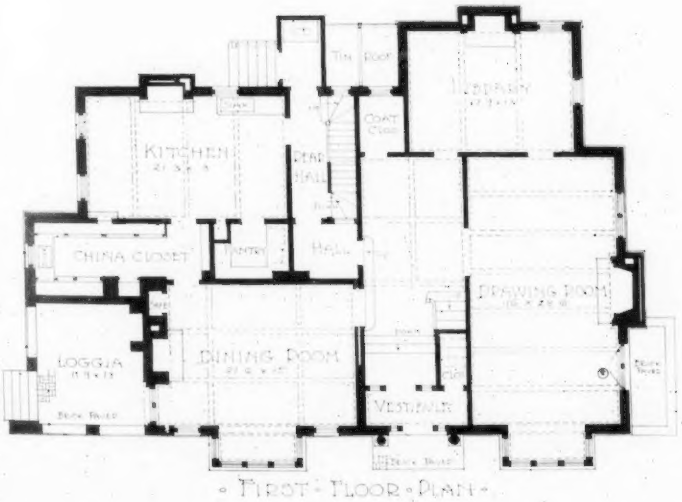
FIRST FLOOR PLAN


CHAMBER
CHAMBER
CHAMBER
CHAMBER
BATH
CHAMBER
CHAMBER

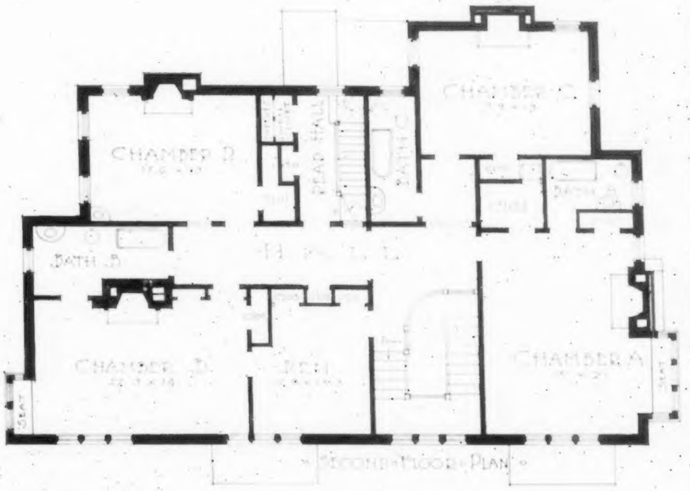
SECOND FLOOR PLAN



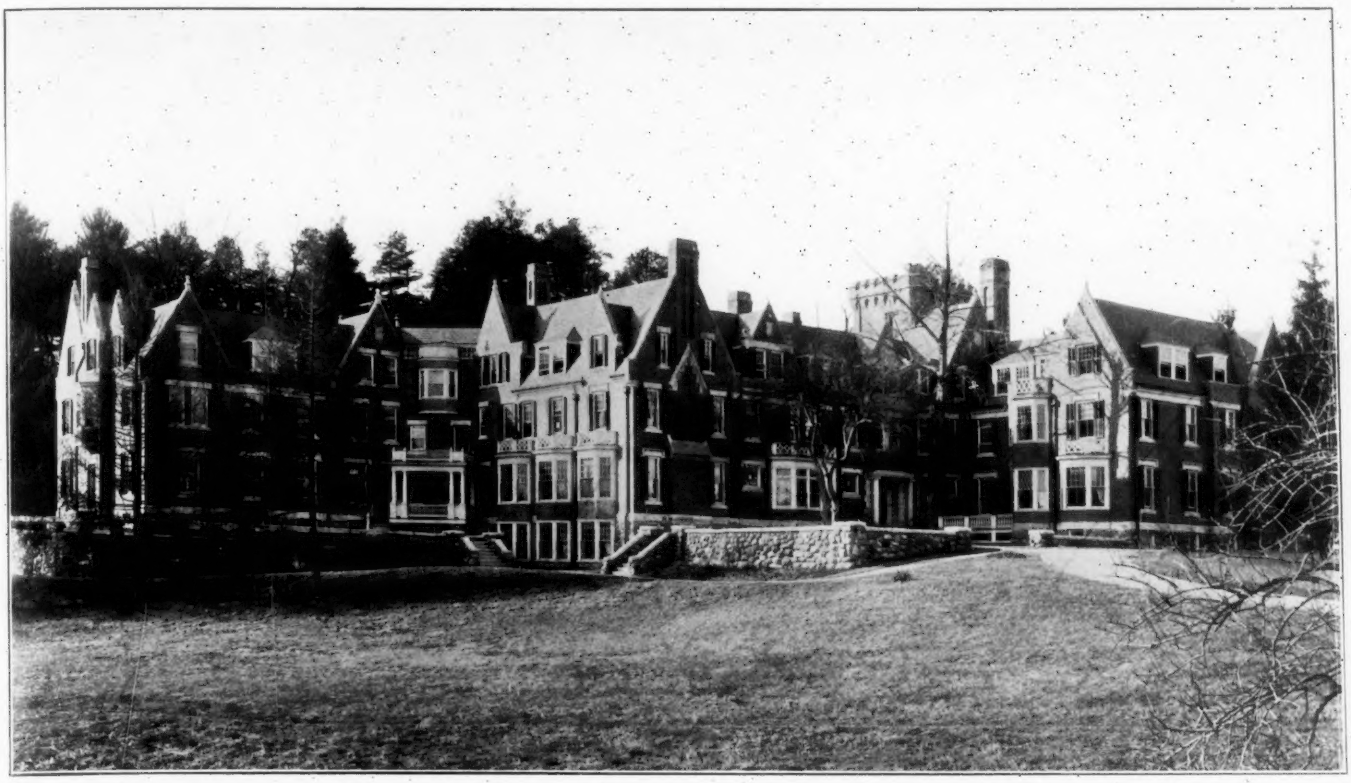
HOUSE FOR H. A. GOWING, ESQ.,
BROOKLINE, MASS.
PHILIP B. HOWARD, ARCHITECT.


TIN ROOF
LIBRARY
KITCHEN
COAT CLOS.
BACK HALL
CHINA CLOSET
PANTRY
HALL
DRAWING ROOM
LOGGIA
DINING ROOM
VESTIBULE
BRICK PAVED

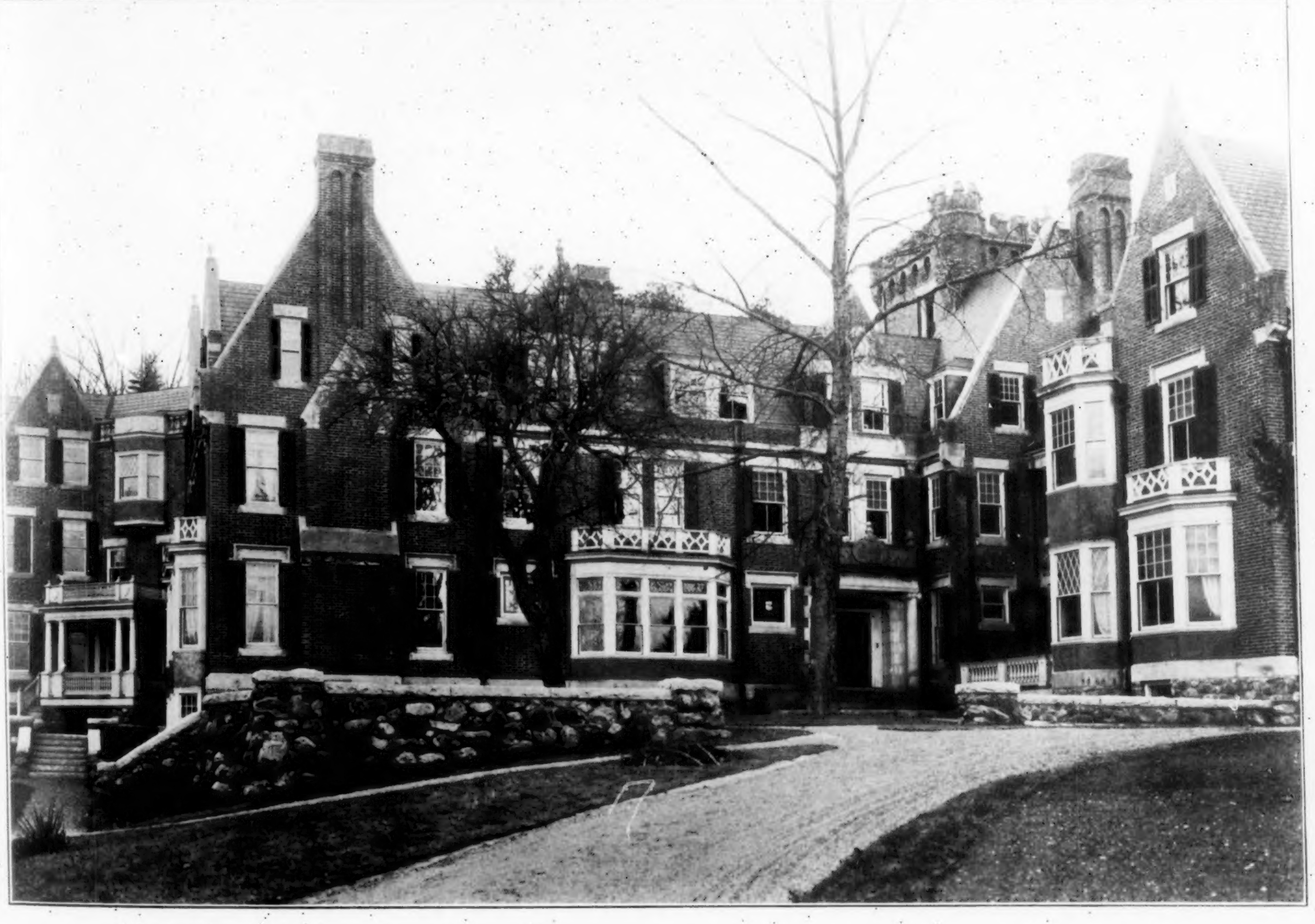
FIRST FLOOR PLAN

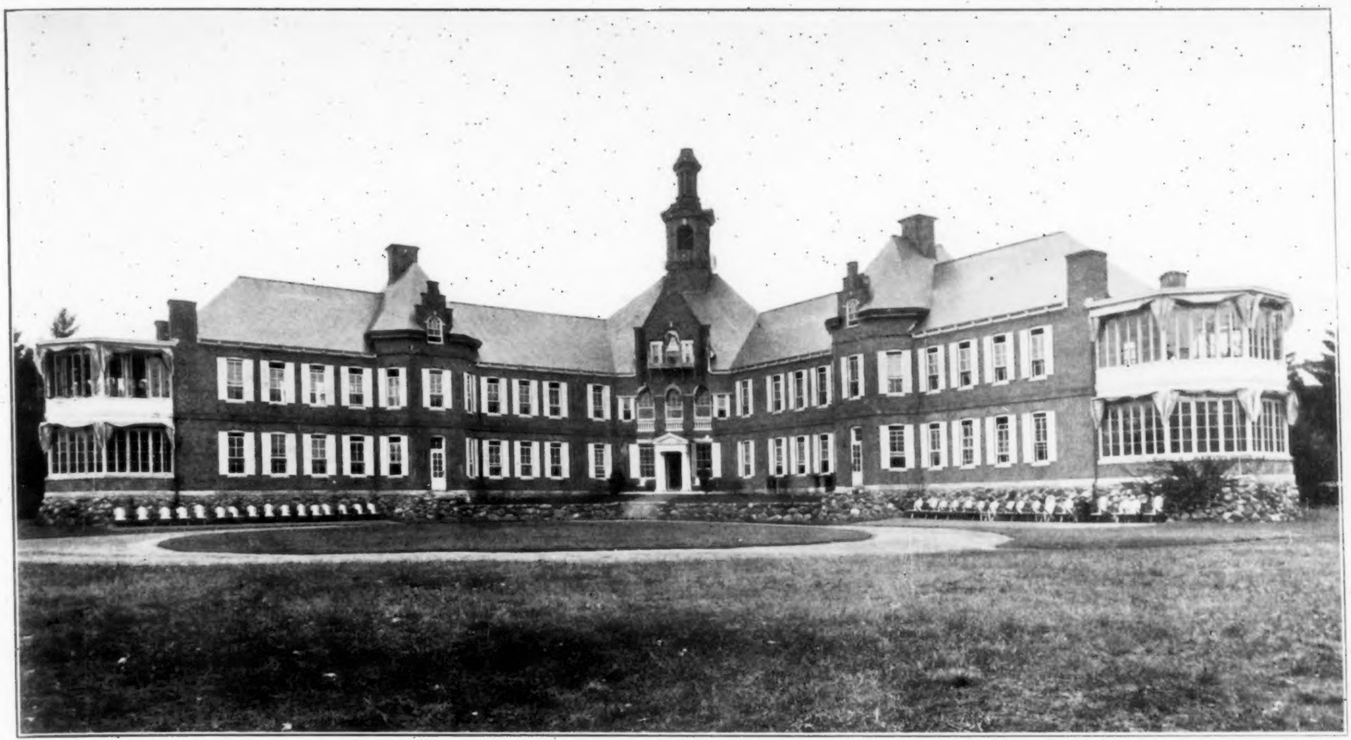

CHAMBER C
CHAMBER B
BACK HALL
BATH C
BATH A
HALL
BATH B
CHAMBER D
DEN
CHAMBER A
SEAT

SECOND FLOOR PLAN

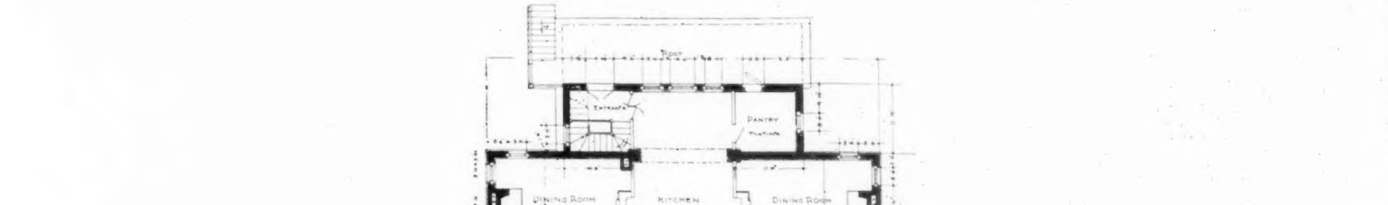


THE HENRY C. NEVINS HOME FOR THE AGED AND INCURABLE, METHUEN, MASS.
HARRIS M. STEPHENSON, ARCHITECT.

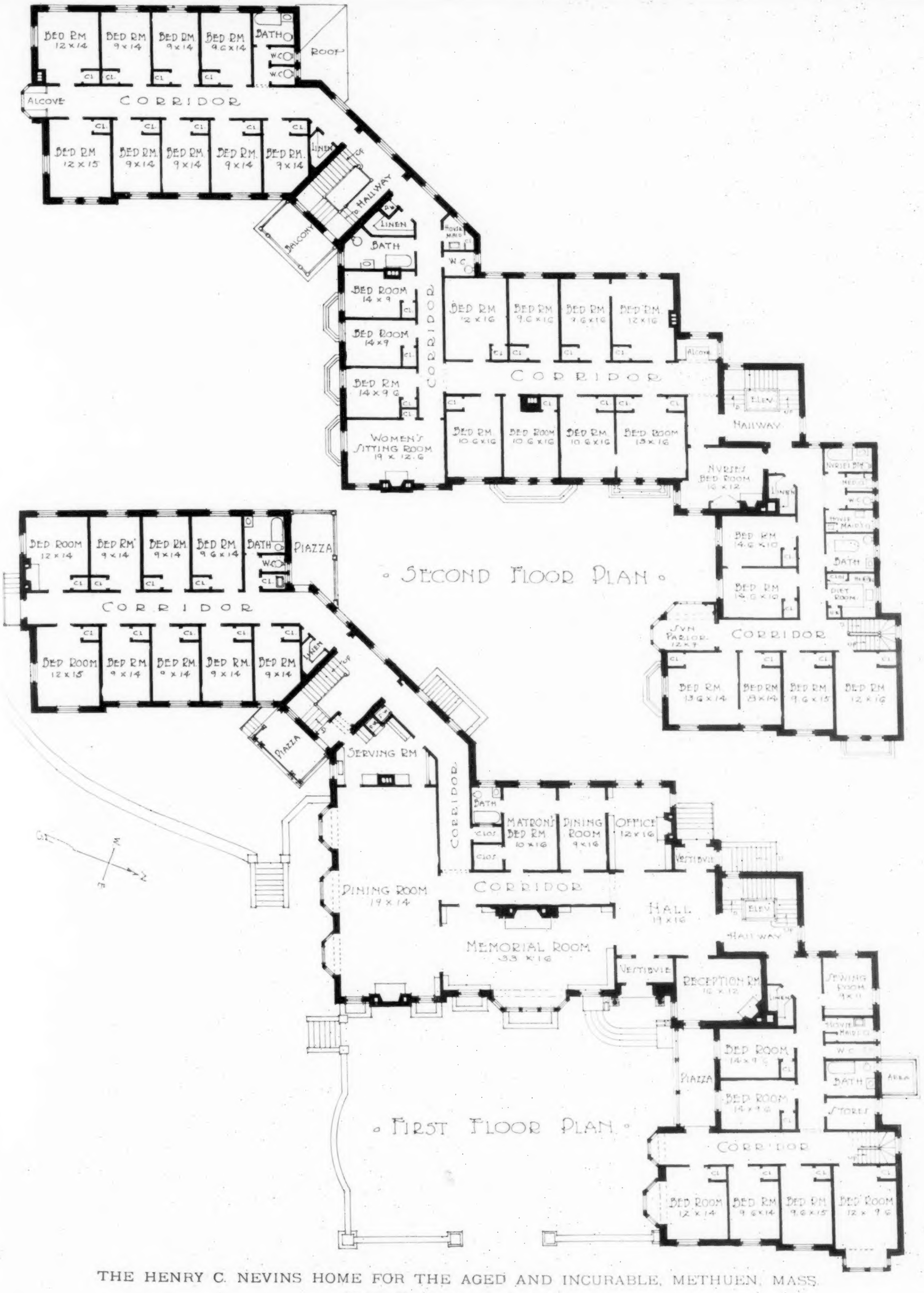




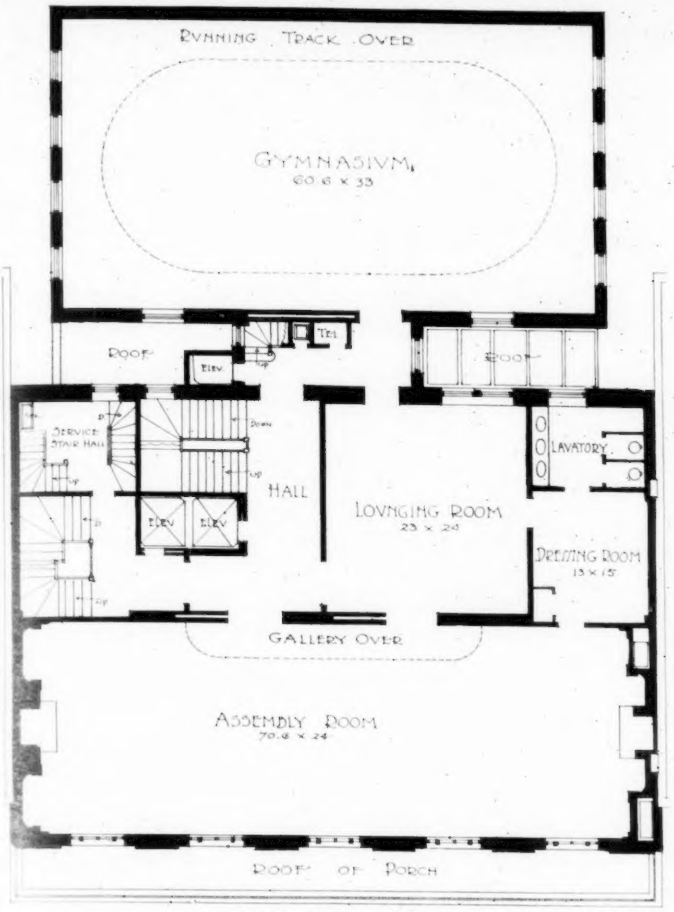
HOSPITAL FOR CONSUMPTIVES,
STATE HOSPITAL, TEWKSBURY, MASS.
JOHN A. FOX, ARCHITECT.


Roof
Entrance
Pantry
Dining Room
Kitchen
Tile Floor
Dining Room
Porch
Entrance
Tile Floor
Vent
Entrance
Tile Floor
Porch
Passage
Reception Rm
Ward
Platform
Ward
Ward
Sun Room
Sun Room

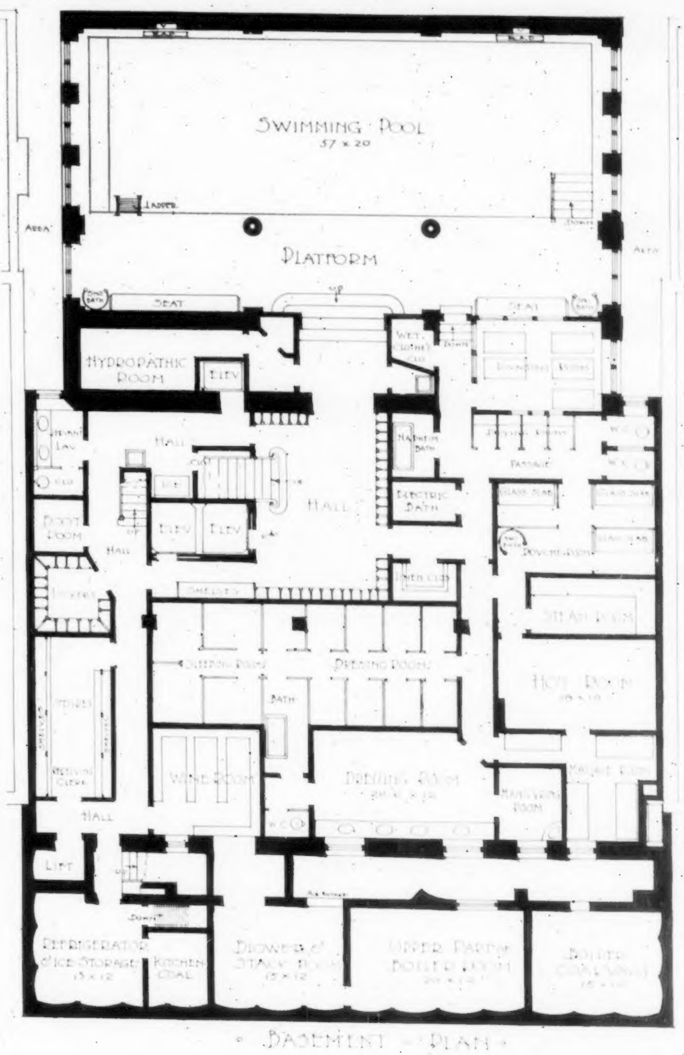
PLAN.


BED RM 12×14
BED RM 9×14
BED RM 9×14
BED RM 9.6×14
BATH
W.C
W.C
ROOF
CL
ALCOVE
CORRIDOR
BED RM 12×15
BED RM 9×14
BED RM 9×14
BED RM 9×14
BED RM 9×14
LINEN
HALLWAY
BALCONY
LINEN
BATH
HOUSE MAID
W.C
BED ROOM 14×9
BED ROOM 14×9
BED RM 14×9.6
WOMEN'S SITTING ROOM 19×12.6
CORRIDOR
BED RM 12×16
BED RM 9.6×16
BED RM 9.6×16
BED RM 12×16
ALCOVE
CORRIDOR
BED RM 10.6×16
BED ROOM 10.6×16
BED RM 10.6×16
BED ROOM 13×16
ELEV
HALLWAY
NURSES BED ROOM 10×12
LINEN
NURSES BATH
HOUSE MAID
BATH
DIET ROOM
BED RM 14.6×10
BED RM 14.6×10
SUN PARLOR 12×9
CORRIDOR
BED RM 13.6×14
BED RM 8×14
BED RM 9.6×15
BED RM 12×16
SECOND FLOOR PLAN
BED ROOM 12×14
BED RM 9×14
BED RM 9×14
BED RM 9.6×14
BATH
W.C
PIAZZA
CORRIDOR
BED ROOM 12×15
BED RM 9×14
BED RM 9×14
BED RM 9×14
BED RM 9×14
LINEN
UP
PIAZZA
SERVING RM
CORRIDOR
BATH
CLOS
CLOS
MATRON'S BED RM 10×16
DINING ROOM 9×16
OFFICE 12×16
VESTIBULE
DINING ROOM 19×14
CORRIDOR
HALL 19×16
ELEV
HALLWAY
MEMORIAL ROOM 33×16
VESTIBULE
RECEPTION RM 16×12
LINEN
SEWING ROOM 9×11
HOUSE MAID
W.C
BATH
AREA
STORES
BED ROOM 14×9.6
BED ROOM 14×9.6
PIAZZA
CORRIDOR
BED ROOM 12×14
BED RM 9.6×14
BED RM 9.6×15
BED ROOM 12×9.6
FIRST FLOOR PLAN
S
W
E
N

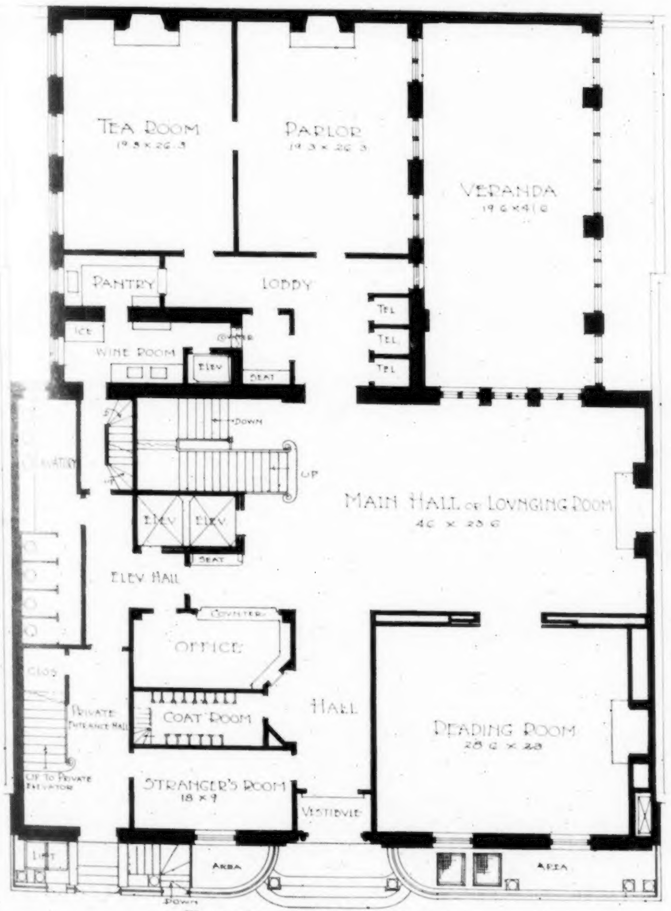
THE HENRY C. NEVINS HOME FOR THE AGED AND INCURABLE, METHUEN, MASS.
HARRIS M. STEPHENSON, ARCHITECT.


RUNNING TRACK OVER
GYMNASIUM
60.6 x 33
ROOF
TEL
ELEV
ROOF
SERVICE STAIR HALL
DOWN
UP
HALL
ELEV
ELEV
LOUNGING ROOM
23 x 24
LAVATORY
DRESSING ROOM
13 x 15
GALLERY OVER
ASSEMBLY ROOM
70.6 x 24
ROOF OF PORCH

• SECOND • FLOOR • PLAN •


SWIMMING POOL
37 x 20
LADDER
AREA
PLATFORM
SEAT
SEAT
HYDROPATHIC ROOM
ELEV
HALL
HALL
ELEV
ELEV
ELECTRIC BATH
STEAM ROOM
HOT ROOM
DRESSING ROOM
BATH
WINE ROOM
DRESSING ROOM
MANICURE ROOM
HALL
LIFT
DOWN
REFRIGERATOR & ICE STORAGE
13 x 12
KITCHEN COAL
FLOWER & STACK ROOM
13 x 12
UPPER PART OF BOILER ROOM
BOILER COAL VAULT

• BASEMENT • PLAN •


TEA ROOM
19.3 x 26.3
PARLOR
19.3 x 26.3
VERANDA
19.6 x 41.0
PANTRY
LOBBY
TEL
TEL
TEL
ICE
WINE ROOM
ELEV
SEAT
DOWN
UP
MAIN HALL OR LOUNGING ROOM
46 x 23.6
ELEV
ELEV
SEAT
ELEV HALL
OFFICE
COAT ROOM
HALL
READING ROOM
28.6 x 28
PRIVATE ENTRANCE HALL
STRANGER'S ROOM
18 x 9
VESTIBULE
AREA
AREA
DOWN
LIFT

• FIRST • FLOOR • PLAN •

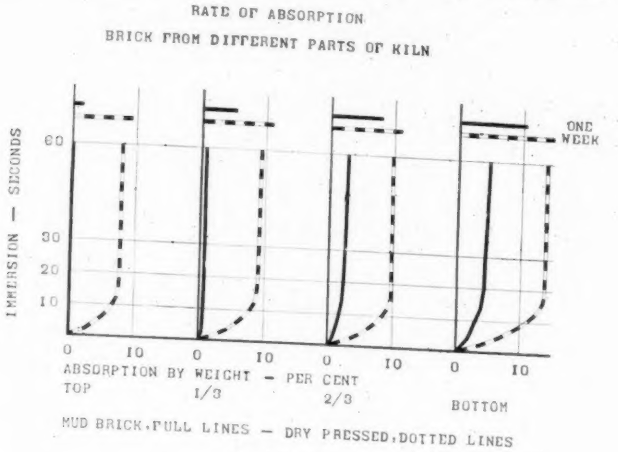
FLOOR PLANS

THE COLONY CLUB,
MADISON AVENUE,
NEW YORK.

McKIM, MEAD & WHITE,
ARCHITECTS.

√

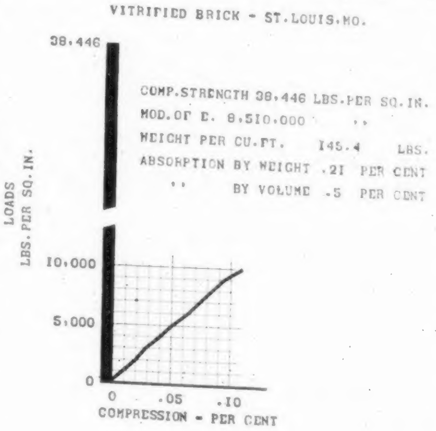
top of the kiln, becoming more compressible as they are taken from the lower parts. The order in which these curves are plotted is the same as in the preceding diagram, with reference to their position in the kiln. It will be noticed that the mud bricks from the bottom of the kiln displayed as much compressibility under a load of 4,000 pounds as the corresponding bricks from the top displayed under twice the load.



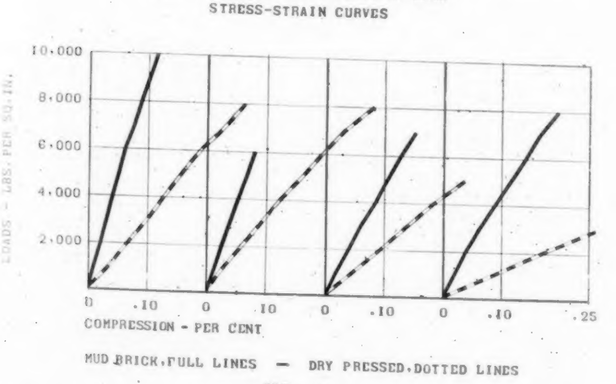
NO. 1.

(No. 3.) The variation in compressive strength is equally pronounced, according to position in the kiln, as shown by this diagram. The weights per cubic foot of the material are entered along the lower edge of the diagram. The highest strength corresponds with the greatest weight. This is characteristic, also, of other materials of construction, high resistance and high density of structure being found in the same samples.

(No. 4.) The properties of a remarkable brick are shown on this diagram. So phenomenal was its compressive strength that it is fully deserving of a special diagram of its own. To St. Louis belongs the honor of producing this brick, which far exceeded in strength any brick heretofore tested at Watertown Arsenal. This sample was tested on end, and reached a total load of 376,000 pounds on a surface 2.45 inches by 3.99 inches in cross-section dimensions.

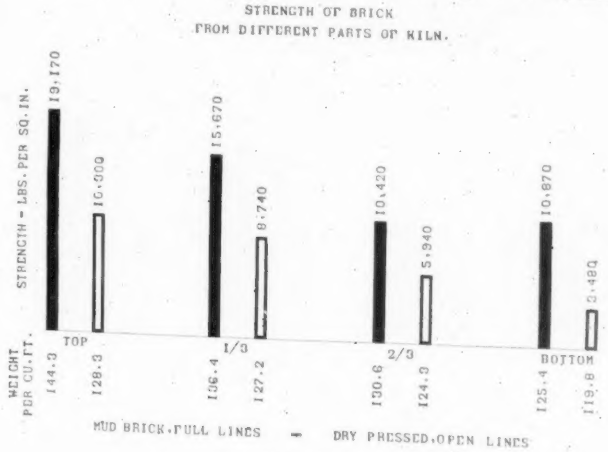


NO. 4.



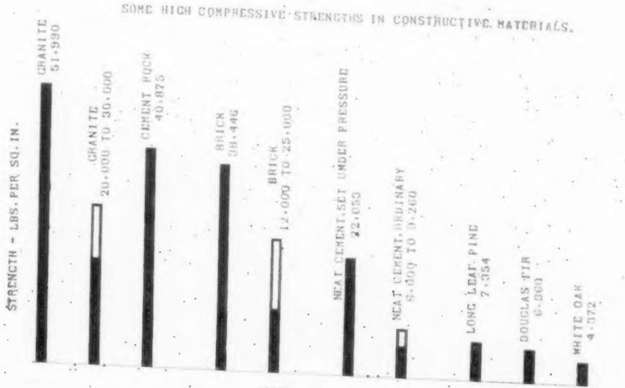
NO. 2.

(No. 5.) The laboratory records were gone over, and from them were selected the results which appear on Diagram No. 5. These tests represent the highest of their respective classes. They are what have been attained, and are presented as standards of excellence. The granite, of 51,990 pounds per square inch compressive strength, came from a quarry in Asheville, N. C. Ordinary granites range from 20,000 to 30,000 pounds per square inch. The cement rock represents the stone from which a natural cement is obtained from the state of New York. The brick, of 38,446 pounds strength, has just been described. Ordinary values for hard-burnt brick range from 12,000 to 25,000 pounds per square inch.



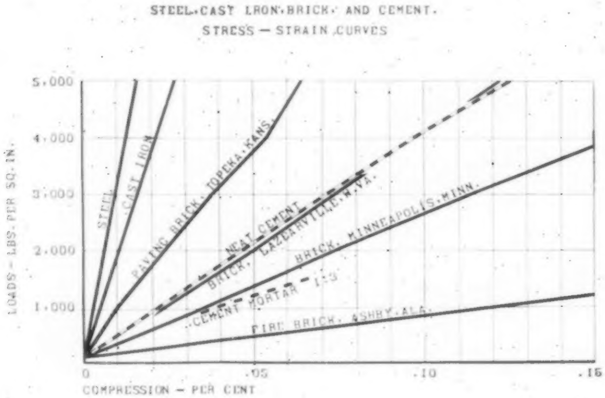
NO. 3.

Portland cement, set under pressure, attained the maximum strength yet observed in this material. This sample was exposed to an initial pressure of 14,000 pounds per square inch while setting. The strength given on the diagram was displayed by the cement at the age of fifty-seven days. The strength of ordinary Portland cement, tested neat, ranges from 6,000 to 9,260 pounds per square inch.



NO. 5.

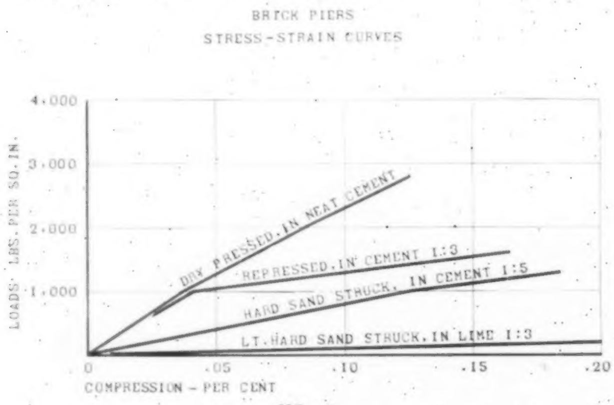
The strength of the white-oak stick seems low, taken in comparison with the strength of the long-leaf pine and the Douglas-fir wood. In small pieces, white oak has



NO. 6.

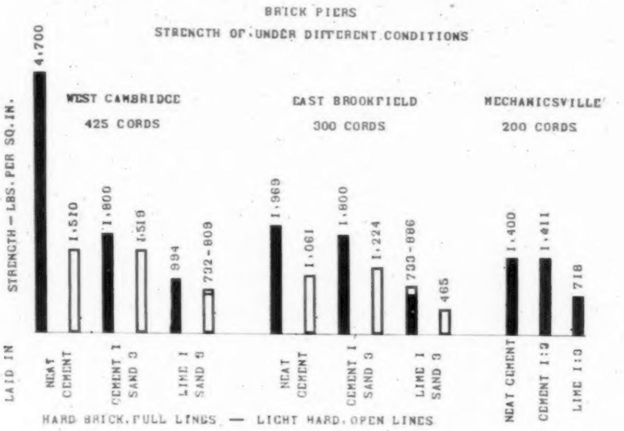
shown a compressive strength of 9,000 pounds per square inch. The figures here given refer to a post of commercial size.

(No. 6) The stress-strain curves of several representative materials are shown on this diagram. Steel and cast-iron are here plotted for reference purposes. A paving-brick from Topeka, Kansas, occupies a position next to the cast-iron and steel. Then follow the curves of neat Portland cement, a brick from Lazearville, West Virginia, then a brick from Minneapolis, Minn., and the curve of a cement mortar of one part Portland cement and three parts sand, and at the lower part of the diagram appears the curve of a fire-brick from Ashby, Alabama. This diagram shows the range in compressibility which may be met with ordinarily. The number of curves might be extended, but other grades of material would occupy places between the curves of the paving-brick and the fire-brick.



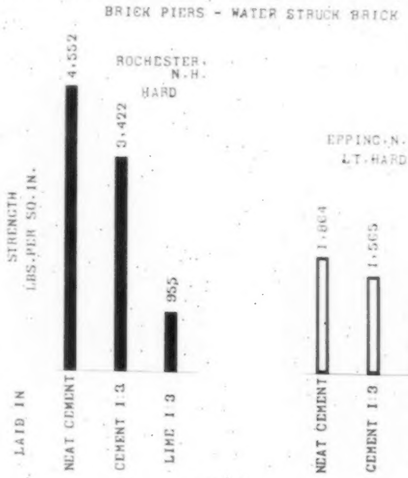
NO. 9.

(No. 7) The strength of brick piers will now be referred to. Diagram No. 7 shows the results with piers made of hard, and light-hard sand-struck brick laid in different kinds of mortar. Brick from three yards are represented, the amount of fuel used being 425 cords, 300 cords and 200 cords, respectively, per million



NO. 7.

brick. One grade only was received from the yard where the smallest quantity of fuel was used, which was classified as hard.

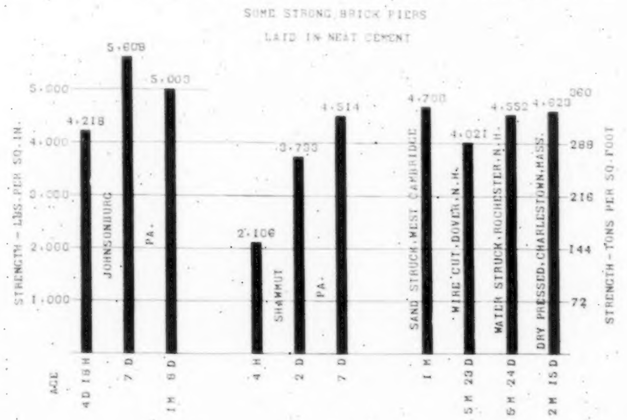


NO. 8.

The range in strength from the hardest brick, laid in neat cement, to the weakest light-hard brick, laid in lime mortar, is seen to be very great. In respect to the compressibility of the piers under loads, the difference is greater than shown by their ultimate strengths. It is desirable to use neat cement or a strong mortar in laying hard brick, in order to attain maximum strength and rigidity. Rigidity is regarded as an important factor in construction as well as strength.

Lime mortar should not be used, when either of the considerations just mentioned are essential.

Two values are shown for two of the piers. The brick from these yards were panelled on one side, and the higher strength in each of these piers belongs to duplicates in which the panels were filled with neat cement before laying.

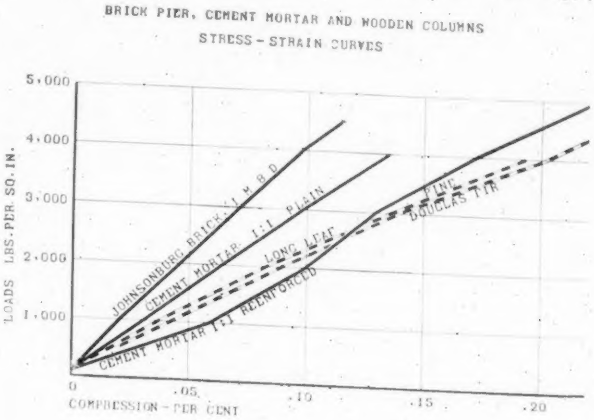


NO. 10.

(No. 8) Some piers made of water-struck brick appear on Diagram No. 8. One firm furnished the hard, another the light-hard brick. The influence of the mortar on the ultimate strength of the pier is again well shown. It seems a wasteful effort to use a weak mortar in which to lay a pier of hard, strong brick.

(No. 9) The curves of compressibility of some piers are shown in this diagram. An earlier stress-strain diagram (No. 6) showed corresponding results on individual bricks and other materials. On the present diagram the most rigid condition pertained to the pier made of dry-pressed brick, laid in neat cement. A pier of re-pressed mud brick appears next in the order of relative rigidity, then a hard sand-struck brick pier laid in less rich mortar than used for the re-pressed brick, and most compressible of the group is the pier of light-hard brick which was laid in lime mortar. The characteristics of these piers depend chiefly upon the quality of the mortar employed.

From this exhibit it may be seen how unfavorable is the action in a wall, the face of which may be laid with one class of work, while the backing is of another.



NO. 11.

(No. 10) In order to illustrate the strength which may readily be attained in brick pier construction, the results of some strong piers have been brought together on the diagram now presented. The four piers represented on the right of the diagram are taken from earlier tests, the results of which are among the published records of the laboratory. The other six represent piers built and tested just prior to the time of this convention. These later ones were intended to be strong piers, a result which was realized in the tests. They were about 8 feet in height each, nominally 12 inches square; they had hollow cores, and the bricks were laid on edge in neat cement.

The ages of the piers are entered along the lower edge of the diagram. One pier, the youngest of the series, was tested the day it was laid. The test began about one hour after the last brick was in place, and was finished three hours later, or when the pier was four hours old. It developed a compressive strength of 2,100 pounds per square inch. The mortar had not hardened, and unusual compressibility was of course displayed. The total load on the pier reached 118 tons, a load far in excess of any which could be expected to be placed upon it in constructive work, at so early an age.

Horizontal lines represent pounds per square inch on the left of the diagram, and, on the right side, tons per square foot. One pier reached a strength of 360 tons per square foot, another exceeded this load. The allowable load prescribed by the building laws of some cities is understood to range from 15 to 30 tons per square foot, which seems a very low limit in the presence of piers possessing the ultimate strength these displayed.

(No. 11) The stress-strain curves of one brick pier, two mortar columns and two wooden posts are shown on Diagram No. 11. These curves stand for strong examples of their respective kinds. These illustrations and others which have gone before were selected, in many of the cases, to indicate what seems best in constructive materials: examples which could safely be followed where strong and safe construction is needed.

## STEEL.

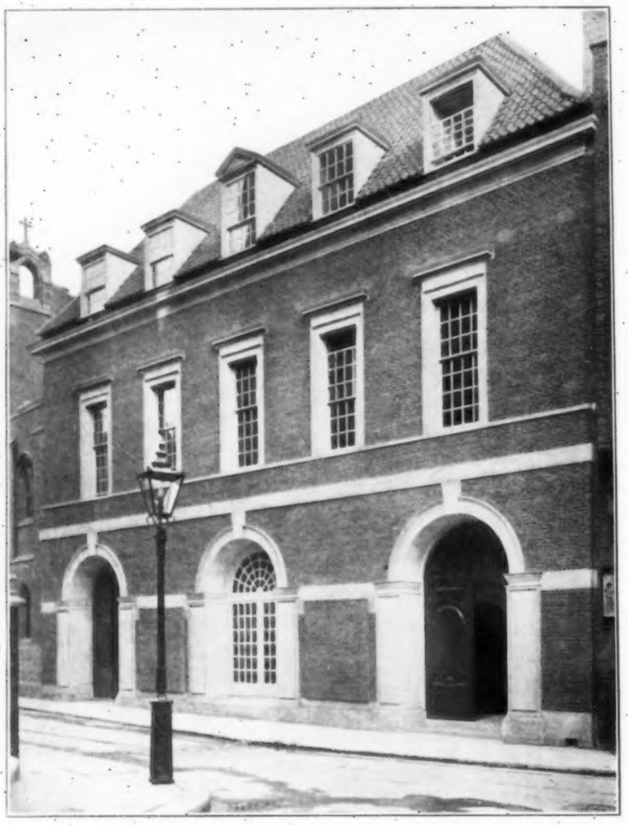
THE constructors of vault doors have been very loth to admit that it is possible to burn a way through a ponderous steel vault door. We notice, however, that in connection with the wrecking of some of the partially destroyed buildings in San Francisco use has been made of the electric arc to cut up the structural members, and the statement appears that it was found cheaper to do this work by electricity, actually burning or melting the steel away, than to use either a hack saw or drill. It is quite possible that electricity may be very extensively used for this purpose at times. Indeed, when the final history of the San Francisco fire is written, it is probable that as many lessons may be learned from the processes of removal of the steel frame buildings as was taught by the fire itself in their partial destruction. We cannot forget that the steel frame is but little more than twenty years old. We do not yet know all its possibilities. The man who in '84 would have dared to predict that there would be erected at the corner of Liberty Street and Broadway a building for office purposes taller than the Washington Monument and outstripping any other structure, past or present, would have been laughed at as the vaguest dreamer. Those were the days when we thought the height of a building was limited by elevator capacity, that an elevator could run safely only at the rate of three hundred and fifty feet a minute, and as one elevator was needed for at least every twenty-five thousand square feet of office space, therefore, by a perfectly simple arithmetical problem it could be demonstrated that a building of over twelve or fifteen stories would of necessity be occupied in the first floor entirely by elevators. Now, with modern methods, elevators which can travel a thousand feet a minute, or more, and with our knowledge of steel and how to use it, there is no known limit to the height of a building. And if we were to judge by the speculative statements of Mr. H. G. Wells, who writes so convincingly about the future, buildings more than a thousand feet high are less of a day dream than the Singer Building would have been twenty years ago.

# A Group of Modern English Houses.

MICHAEL BUNNEY

WHILE efforts are being made on every hand to bring the standard of modern brickwork up to the level of the old as regards traditional methods of handling the material and by improved attention to texture and its value as a factor in design, architects are also availing themselves more and more of other means by which to infuse distinctive qualities into their work. Of these means, perhaps the most far-reaching in its effects is the revival of the use of the small special-made brick.

In a former paper on the subject of modern English brickwork, the causes of the decline in the use of small bricks were dealt with, and no further demonstration of the value, from an architectural standpoint, of the size of bricks when correctly gauged to the circumstances of each case is required than that afforded by numberless brick buildings still standing that date their erection before the standardization of brick dimensions became necessary. It will be well, however, briefly to enumerate the advantages that the use of small sized brick does under certain conditions confer upon a building.



MISSION HOUSE, WESTMINSTER.
Edwin L. Lutyens, Architect.

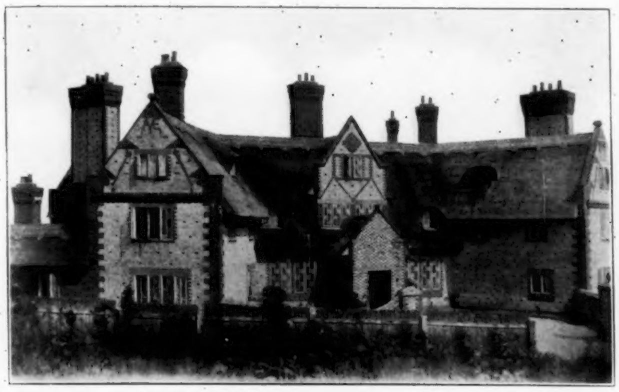
In the first place, the small bricks entail a greater number of courses to any given height than is the case when those of the standard size are used, and this in the same measure will increase the number of joints; now this addition to the sum total of visible mortar joints produces a very palpable effect, mitigating to a large degree the predominating color of the wall surface, that is to say, the color of the bricks themselves. When the mortar joint also is of a generous dimension, say three-eighths of an inch in thickness, the resultant is a breaking up of the surface both as regards color and texture that is satisfactory from every point of view.

**HOUSE AT EALING.**
W. A. Pite and R. S. Balfour, Architects.

Nothing will bear this out more convincingly than a comparison between the brickwork of the Mission House at Westminster, carried out by Mr. Lutyens, and most of the modern brickwork where standard sized bricks and a thin joint have been employed. The dullness of modern brickwork of the ordinary type is almost entirely the outcome of that uniformity of surface and consequent loss of quality which a thin joint brings about.

In the Mission House mentioned, as well as at some other buildings in London, Mr. Lutyens has used a brick measuring about 6½ x 3 x 1¾ inches and imported from Holland. The bricks are made of a particularly plastic clay which is burnt very hard and twists and warps a little in the burning; the surface has a very coarse grain. These qualities would, no doubt, be accounted imperfections by the devotee of accurate bricklaying and a so-called perfect surface, but they are the qualities that make all the difference between a dull and an interesting wall surface and impart a character wholly absent from

**THE VICARAGE, EALING.**
W. A. Pite and R. S. Balfour, Architects.

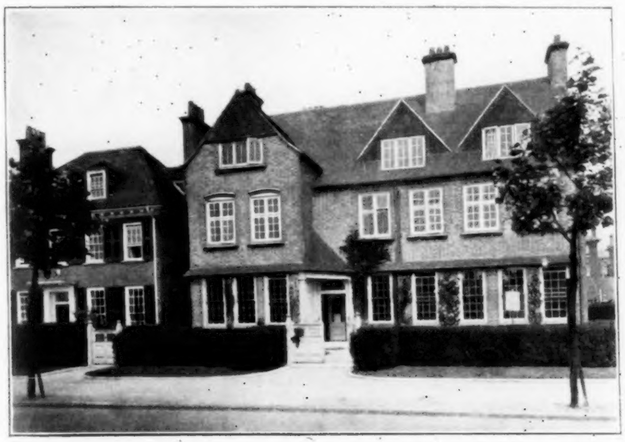


HOUSE AT HAPPISBURGH.
Detmar Blow, Architect.

uniform work. The mistaken idea that unless a brick is square and true it is a bad one to lay, dies hard — provided the mortar is good, there is no reason whatever why a thick bed of it should not be used in which to lay a twisted brick properly and, in addition, obtain a wide joint on the surface.

Very often, too, when buildings are not of a large size, the small brick will be found to be much more in scale and an aid to correct proportion when the walls are cut up with openings or other features.

Some architects are showing an inclination to go back to what might be termed "locality" work; that is to say, they have seized upon certain characteristics peculiar to the brickwork of localities in which they happened to be building, as a rule expanding and developing these local hall-marks with good results. As these local varieties are much less numerous and definite in the brick producing districts than where stone is the principal building material, it will suffice to deal with two of them.

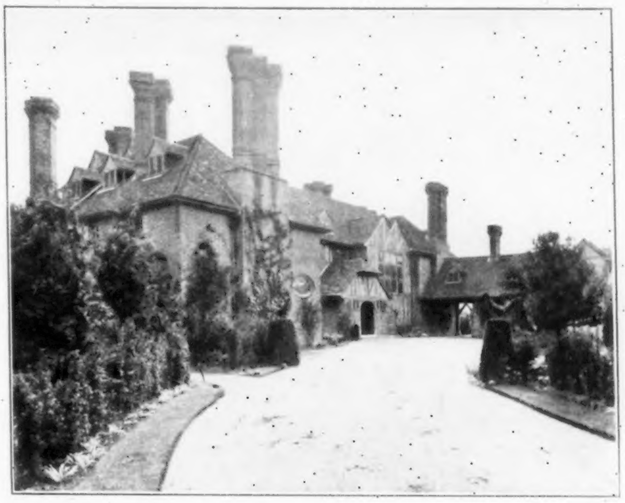


SIBERTSWOLD.
Balfour & Turner, Architects.

East Anglia is essentially a brick country and here, owing to easy access to continental examples, themselves mostly of brick, and the consequent fostering of a taste for continental methods, a brickwork tradition grew up, based on a foundation half English and half Dutch, remaining, nevertheless, purely local.

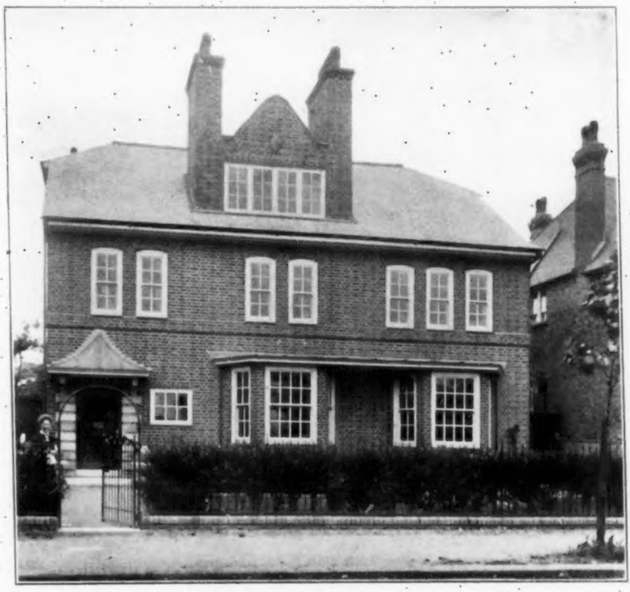
These Flemish-looking gables with their gusseted parapets and quaint intermixture of brick with flints and other materials find admirable exponents now in Detmar Blow and E. S. Prior who have both revived this interesting variety of work in their well-known houses at Happisburgh and Kelling.

Down in the South, in the forest counties, there is another variety of brickwork, not, perhaps, quite so local as that of the east coast, but still sufficiently characteristic and confined to a more or less well-defined district. The local feature of this work is the use that is made in it of the vitrified ends of the bricks for pattern work and dressings. These black and shiny "headers" are produced accidentally by the wood fire in the kilns coming into contact with a clay charged with a proportion of sand sufficient to impart a dull glaze to the surface of the brick.



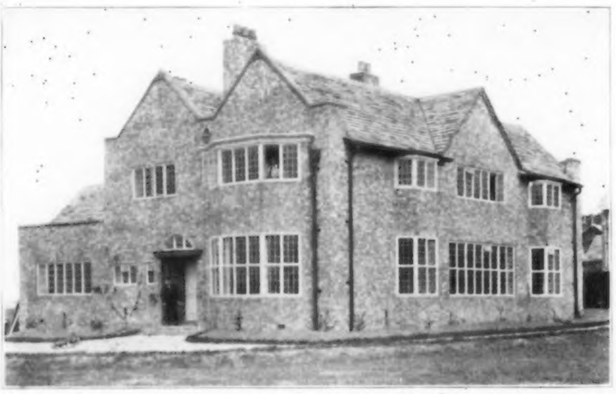
GREAT HOUSE COURT, FROM THE DRIVE.
E. Turner Powell, Architect.

In a haphazard and incidental fashion these vitrified ends have always appeared in South country work, but recently a more extended use has been made of the possibilities they possess for decorative arrangements and for endowing the wall surface with quality and richness.



ST. ETHELBURGER, EALING.
W. A. Pite and R. S. Balfour, Architects.

In London, Thackeray Turner has carried out many small brick buildings on broad and simple lines, dependent mostly on the excellent selection and handling of the material. He has also made a free use in a somewhat new way of the old English "rubber" brick; leaving the usual and older method of utilizing this soft brick for cut and molded work, he has adopted it as a facing brick rubbed on its exposed side and set in a fine putty joint, thus securing a broad, smooth surface full of good and, even in London, permanent color, to contrast with the rougher and dirtier texture of the common brick.



HOUSE NEAR MANCHESTER.
Edgar Wood, Architect.

HOUSE AT EDGEBASTON, BIRMINGHAM.
Cossins & Peacock, Architects.

In the suburbs of most of the big provincial towns good brick architecture is springing up, the most successful buildings, as a rule, being those in which local materials and tradition are faithfully adhered to. Even the uncouth and ugly Lancashire brick has yielded good results at Edgar Wood's hands in some of his new works in the outskirts of Manchester, for he has been content to keep his brickwork rough and clumsy in its execution instead of trying to get a fine and even surface with a brick that lacks these qualities and in addition is but poor in color.

The failures in brickwork design are brought about most often by the attempt to produce effects, which only the very finest kind of brick can properly achieve, with a material varying far more than even stone in all the essential qualities of color, texture and adaptability.

# Editorial Comment and Selected Miscellany

## PERCENTAGE OF FIRE LOSS

MR. F. J. T. STEWART, Secretary of the Committee of the National Fire Protection Association which compiled the report on the Baltimore conflagration, and a member of the staff of the Continental Insurance Company of New York, has worked out a very interesting and instructive table showing the percentages of cost for the various parts of a fireproof structure, prepared from data furnished by architects and builders in the principal cities. A first-class building exposed to a conflagration will be heavily damaged in all items of construction except the foundations and steel. These two items will be approximately twenty per cent of value, and to this may be added about ten per cent for other salvage, chiefly on mason work, so that the maximum probable damage to a first-class steel frame building would not exceed seventy per cent. This is a large element of loss but Mr. Stewart's conclusions show beyond question that even with such large damage the fireproof buildings are really all that will save cities from repeated disastrous conflagrations.

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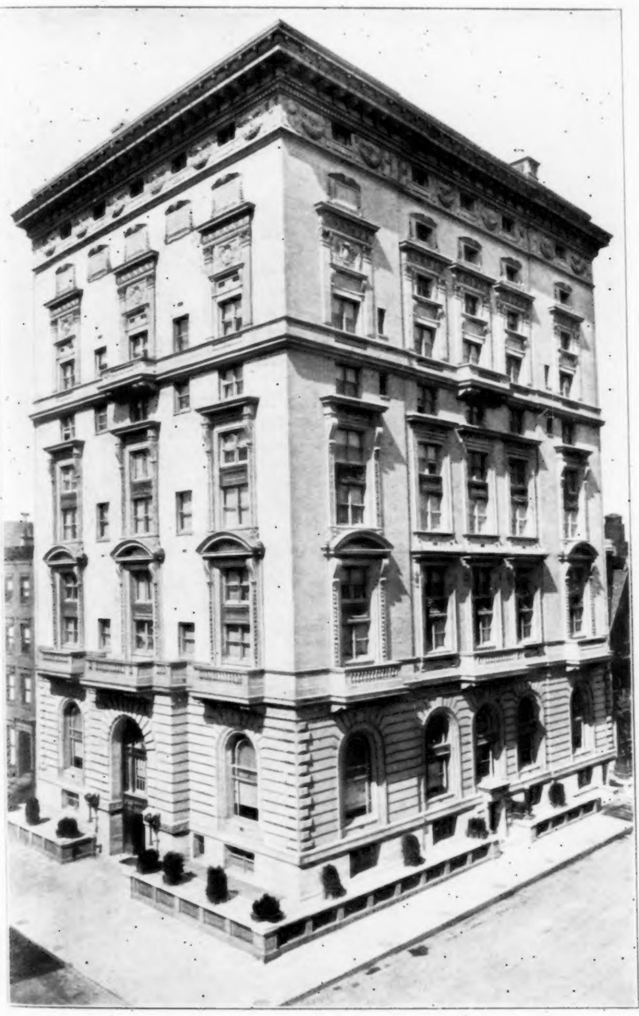
Parker & Thomas, Architects.

## PHILANTHROPISTS AND THE BUILDING LAWS.

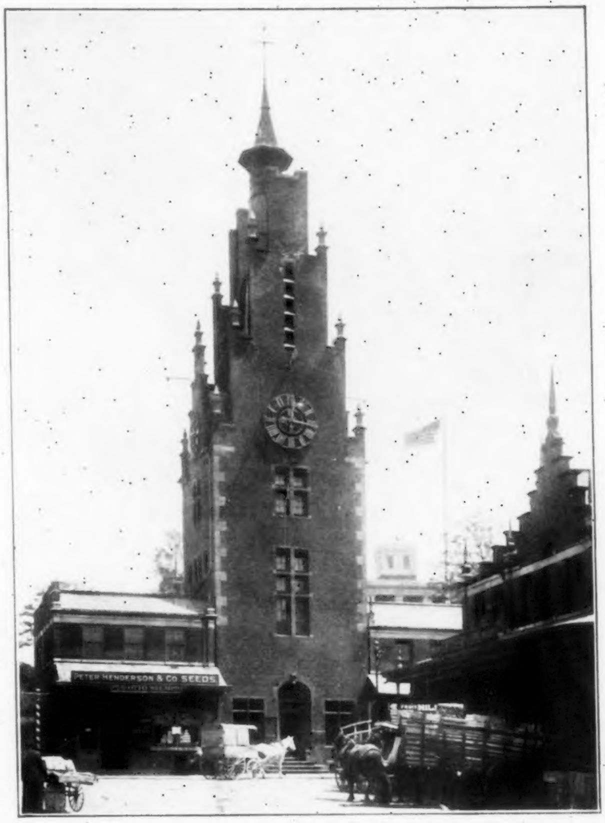
THERE is no more disinterested and public-spirited group of men and women than the philanthropists who so ardently give their thought and services in our large cities to the bettering of the condition of the poor. There is also no class which can so easily confuse the issues and impose unnecessary restrictions upon building operations. It is safe to say, however, that if the charitable societies were to frame our tenement house laws, there would be no more tenement houses built, for the cost would be prohibitive, and our tenement house population would, of necessity, be forced to cities where building laws do not exist. It is by no means a misfortune to a city to have a large tenement house district. The bone and sinew of our large cities are not afforded by the wealthy or the middle classes, but by the artisans, the laborers and the poor who do the hard, necessary work with their own hands, and who are obliged to live in inexpensive quarters. Consequently any regulation which hinders the economical housing of this class, which imposes unnecessary constructive burdens upon them should be looked upon as ill advised legislation.

## LICENSING ARCHITECTS.

SEVERAL states now require an architect to take out a license to practice. So far as we have had occasion to compare notes with architects in the states in which architecture is so regulated, we find a fairly even concensus of opinion that no real good has come by licensing the profession, and we have yet to find a cogent reason why the system should be extended to other states. The theory that it protects the properly qualified architects is hardly substantiated by facts. The best architects do not need the protection, and, apparently, the others get no more protection against scalliwags than is afforded in other states. It is one of those measures which is directed against a fancied condition, and remedies this condition in an imaginary way, and this is really about all that can be said in its favor. We cannot see that the standard of professional practice is materially higher in one state than another, and licensing seems to us merely an added burden imposed upon the practice of architecture.



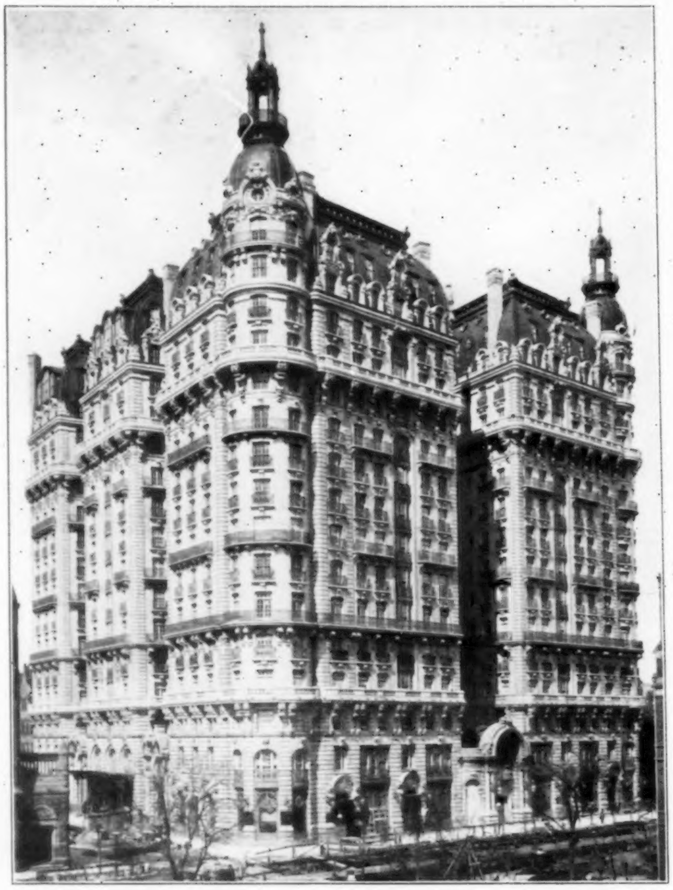
CRESCENT ATHLETIC CLUB, BROOKLYN.
Frank Freeman, Architect.
All four sides built up of light gray brick, made by Sayre & Fisher Co.



MARKET TOWER, BROOKLYN.
W. B. Tubby & Bro., Architects.

## IMITATION ARCHITECTURE.

LONGFELLOW has a very apt quotation in which he refers to "architecture existing in itself and not in seeming a something it is not." If the poet could view our architecture of to-day as we sometimes see it he might have to recast his characterization, especially in view of the way in which concrete is being used. We have no fault to find with the material; it is flexible, readily adaptable to all sorts of emergencies, and when properly used and properly applied is a valuable aid to the constructor, but we have yet to see any really satisfactory treatment of concrete as concrete from an artistic standpoint. If one doesn't care how badly it looks, how much it catches the dirt, how much it may be streaked or variegated in tone, or how unevenly its surface may craze, there will be little worry coming on this subject, but no architect can feel quite happy with the appearance of any structure, however utilitarian, which presents the outward aspect of even the best of our concrete work. It exists in seeming what it is not, or else it exists as an unsightly, blotchy, thoroughly undesirable appearing wall surface, with which the only possible thing to be done is to cover it with a charitable coating of paint and forget that it has an individuality of its own. In our large cities limestone and sandstone will discolor, but they are immaculate compared with concrete, except when the latter material deliberately starts out to imitate something else. The Harvard Stadium is an example of concrete work at its best. Attempts were made to finish the surface with hammering, with a wash of cement, with troweling and with no treatment at all, leaving the imprint of the mold boards on every surface. We rather prefer the latter. It is frankly constructive, but it at least does not masquerade as imitation.



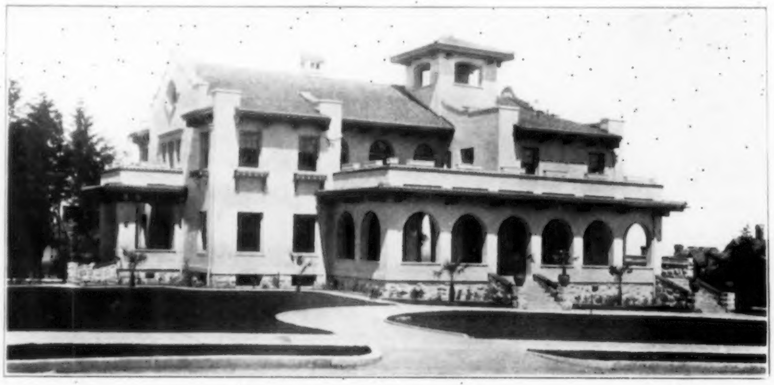
ANSONIA APARTMENT, BROADWAY, NEW YORK.
Paul A. Duboy, Architect.
Terra Cotta furnished by New York Architectural Terra Cotta Co.

## AN INTERESTING AND VALUABLE TRADE PUBLICATION.

"BURNT Clay Products in Fire and Earthquake" is the title of an unusually interesting and valuable work which has been issued by the Brick Construction Association of Los Angeles, Cal. It consists of ninety-six pages and cover, containing eighty-three half-tones, showing the effect of fire and earthquake on concrete, reinforced and plain, the defects of concrete in general, hollow cement block collapses, frame building collapses, and collapse and official report of the Hotel Bixby disaster, Long Beach, California. Also results of brick and clay products in San Francisco in fire and earthquake, with concise descriptions and short technical extracts by the leading architects and engineers. The printing of this publication was prompted by the claims that were made by the cement interests against brick and tile.

It is allowed that this work is put forth by partisans, but even so, we believe that they have spoken the whole truth, and nothing but the truth, and are wholly justified by the facts in presenting the case in the manner in which they have. The Association is made up of men who have business interests to protect, but in doing so they have presented data which will have a value to any unbiased mind. The Architects and Builders of this country will welcome, we believe, anything which will enlighten them upon the conduct of building materials in the San Francisco calamity. This work does it, and does it well.

The enormous cost of compiling this work has made it necessary for the Association to charge $1.00 per copy.



HOUSE AT TACOMA, WASH.
Russell & Babcock, Architects.
Roofed with Ludowici-Celadon Tiles.

## IN GENERAL.

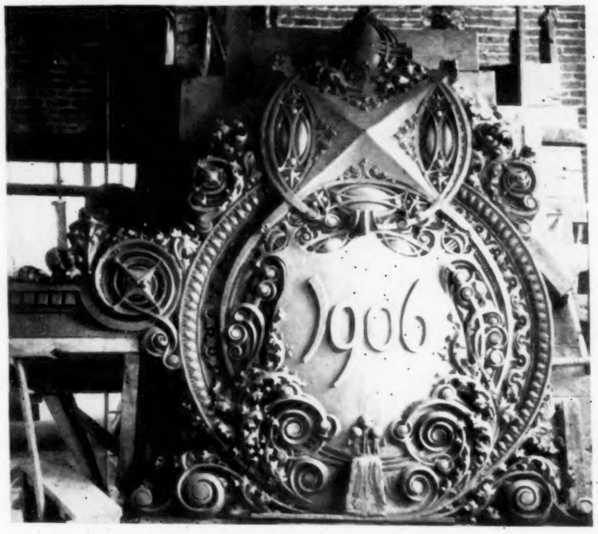
Hobart A. Walker and Elliott W. Hazzard have formed a co-partnership for the practice of Architecture. Offices, 437 Fifth Avenue, New York, N. Y.

Charles A. Gunn, Architect, has opened an office in the Union Bank Building, Pittsburg. Manufacturers' catalogues and samples desired.

The Architectural League of America held its annual Convention at Washington, D. C., April 22, 23 and 24. A report of this Convention will be published in THE BRICKBUILDER for May.

The American Enameled Brick and Tile Company will supply 200,000 of their brick for use in the exterior of a building at Youngstown, Ohio, of which John Stamburgh is the architect.

The Brooklyn Chapter of the American Institute of Architects will hold its Seventh Annual Exhibition at the Pouch Gallery, Clinton Avenue, from May 6 to May 18 inclusive. Exhibits of drawings, photographs, sculpture and objects of industrial art are desired from all interested.



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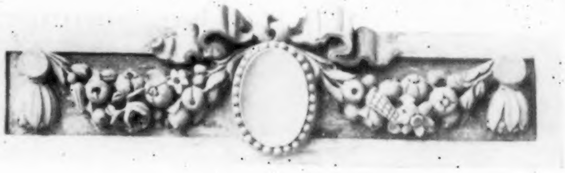
## NEW BOOKS.

The Architect's Directory and Specification Index for 1907. New York: William T. Comstock. One 8vo vol., red cloth. Price, $3.00.

Containing a complete list of the architects in the United States and Canada. Classified by states and towns, indicating those who are members of the American Institute of Architects; also the names of the officers and locations of the different architectural associations in the United States and Canada. Prepared with the greatest care to secure accuracy both in names and locations.



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Rumford Fireplaces and How They Are Made. By G. Curtis Gillespie, M. E. Arch. Containing Benjamin, Count Rumford's Essay on "Proper Fireplace Construction." New York: William T. Comstock. Price, $2.00.

A plea for a more general consideration of the form and proportion of a very much neglected feature of our homes and buildings, with nearly two hundred illustrations, including the original Rumford drawings; diagrams for fireplace construction, and numerous ancient and modern mantels and fireplaces, one hundred andiron designs and other details and fixtures, together with preface and explanatory notes.

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Modern Plumbing Illustrated. New York: William T. Comstock. One large 8vo vol.; cloth; pp. 392. Price, $4.00.

This work is an eminently practical work representing the best modern practice in plumbing and water supply. Naturally, the questions of drainage and sewerage occupy first place. On these questions the author has followed the requirements of the City of New York and other important cities, as well as the requirements of the United States, in all matters of drainage and sanitation.

A special feature of the work is the liberal scale drawings, which cover almost every imaginable condition likely to come before the plumber, architect or sanitary engineer.

In treating city work the sewerage occupies first place, but in dealing with country work the author has entered quite fully into the question of water supply. Here, also, the question of sewage disposal has been treated at considerable length, showing the various systems that have proved acceptable under varying conditions.

Glossary of Terms in English Architecture. By Thomas Dinham Atkinson. New York: William T. Comstock; Price, $1.50.

This little book is limited to the historical aspect of architecture, and only deals incidentally with words used in art and art criticism and in building. But at the same time many technical terms are to be found, and constructional terms in particular; for construc-

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tion lies at the very root of the matter.

Many terms used in Greek and Roman architecture are included because they are necessary to a proper understanding of Renaissance architecture and church building. For this reason the general principle has been to include those terms which have a direct bearing on English architecture, whether they deal with decorative forms or with the planning of buildings.

## BUILDING OPERATIONS FOR MARCH.

REPORTS from fifty-five leading cities of the country officially reported to *The American Contractor* New York, and tabulated, show a gratifying and widely distributed building activity for March. In the cities reported thirty-one show a gain as compared with the corresponding month of 1906, while twenty-one indicate a loss. In the aggregate the loss amounts to 3 per cent. This is decidedly encouraging when compared with the showing made in the preceding month, when the total loss, as compared with March, 1906, was 20 per cent. The greatest loss reported is in New York. Manhattan lost $4,952,621 and the Bronx $1,790,535, while Brooklyn made a gain of $1,414,637, making a total loss for Greater New York of $5,328,519, or over three millions more than the total loss of the fifty-two cities. The loss in New York is clearly chargeable to previous large building operations and the stringency of the money market which makes it difficult to place large building loans. Taking this into account the showing is excellent, a marked improvement over the preceding month. Chicago, the city next on the list from the standpoint of volume of business, reports a gain of 33 per cent. The percentage of gain in other leading cities is shown by the following figures: Allegheny, 96; Birmingham, 112; Buffalo, 45; Cleveland, 51; Detroit, 80; Harrisburg, 9; Hartford, 21; Indianapolis, 149; Minneapolis, 38; Memphis, 25; Mobile, 225; Paterson, 57; Rochester, 31; St. Louis, 53; St. Paul, 30; Scranton, 50; Seattle, 107; Syracuse, 60; Salt Lake City, 316; Topeka, 153; Washington, 23. The following figures show percentages of losses: Cincinnati, 4; Denver, 18; Duluth, 62; Grand Rapids, 9; Kansas City, 18; Louisville, 32; Los Angeles, 41; Milwaukee, 1; Newark, 32; New York, 23; Omaha, 23; Philadelphia, 31; Pittsburg, 5; Spokane, 8; Toledo, 51; Tacoma, 20.

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